# JAGAN NATH UNIVERSITY

## Question Bank for B.Tech. I Sem.

## Subject: INTRO TO Electrical & Electronics Engineering (BT104)

**UNIT 1:**

**1.** Determine the current which flows through a 1f capacitor when,

(i) The voltage increases linearly at the rate of 1000V/S.

(ii) The energy storage remains fixed at 0.0005J.

**2.** Find the inductance of a coil in which.

(i) Current of 0.1A yields energy storage of 0.05J.

(ii) A current increases linearly from 0 to 0.1 A in .2 sec producing a voltage of 5V.

**3.** Define resistance and its unit. A heater element is made of nichrome wire having resistivity equal to $100 \times 10^{-8}$ ohm-m. The diameter of the wire is 0.4mm. Calculate the length of the wire required to get a resistance of 40 ohm.

**4.** Define magnetic flux and its unit. A coil of 500 turns is wound on a magnetic circuit of reluctance $10 \times 10^{5}$ AT/Wb. If a current of 2A flowing in the coil is reversed in 5ms , find the average emf induced in the coil.

**5.** (a) Discuss the characteristics of ideal current source and ideal voltage source.

(b) A series circuit contains a resistor R and capacitor C connected to a voltage source V through a switch. The capacitor initially has zero voltage. Write down expressions for voltage across the capacitor and current in the circuit when the switch is closed at time t=0. Plot these as function of time.

**6.**

(a) Write down the relationship between electric potential and electric field. Which of these is scalar and which is vector?

(b) Discuss the concept of magnetic flux. State and explain the Faraday's law linking magnetic flux with induced emf.

**7.** (a) (i) Define the magnetic flex density.

(ii) The resistance of a conductor 1 $mm^2$ in cross section and 20 meter long in 0.346 Ω. Determine the specific resistance of the conducting material.

8. (a) Explain the terms

**(i)** resistance
(ii) capacitance
(iii) inductance

(b). Define the inductor. Derive the expression of integral voltage – current Relationships.

**9.** (a) Explain the terms

**(i)** Electromotive force,
(ii) Energy

(b) (i) Calculate capacitance of parallel plate capacitor.

(ii) Explain Ohm's law.

10.

(a) Explain the terms

**(i)** Linear and Nonlinear
(ii) Active and Passive.

(b) Define the four different types of dependent sources in electric circuits.

## UNIT 2:

**1.** State and Explain Kirchoff's Law. Find the relationship for converting star connected resistors into an equivalent delta connected resistors.

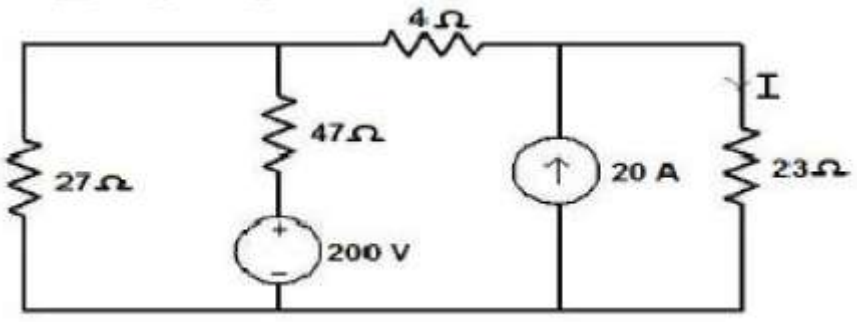
**2.** State and Explain following theorems with example.

(i) Thevenin Theorem (ii) Super Position Theorem

**3.** State and explain following theorems with example.

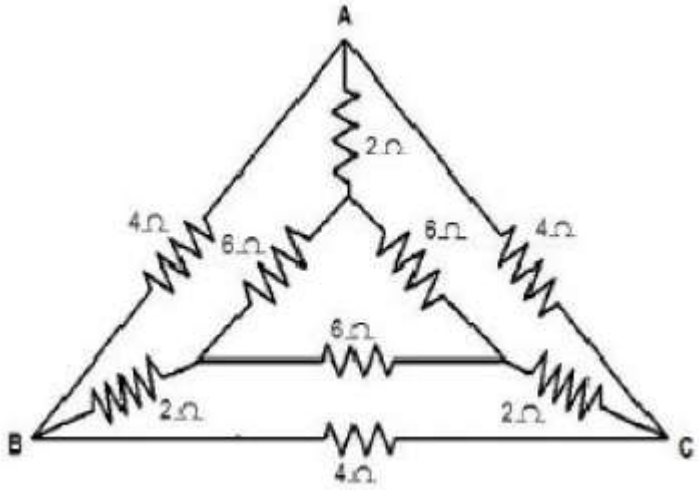
(i) Norton theorem (ii) Maximum Power Transfer Theorems.

**4.** (a)State Kirchhoff's voltage law.
(b). Compute the current in 23 ohm resistor using super position theorem for the circuit shown below.



**5. (a)** State Kirchhoff's Current law.

(b) Find the equivalent resistance between B and C in given figure.

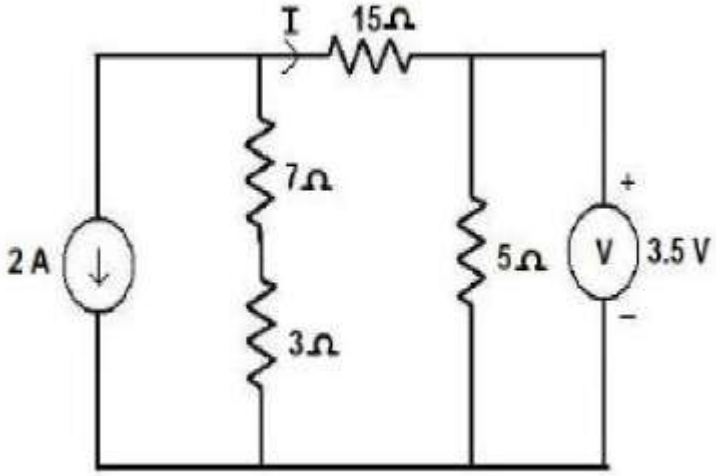



**6.** (a) Write down the rules for circuit analysis using node voltage and mesh current methods.

(b) A cube is formed in which each arm has a resistance of 1 Ohm. 5 Volts is applied across the one of the diagonal points of the cube. Calculate the current drawn from the voltage source.

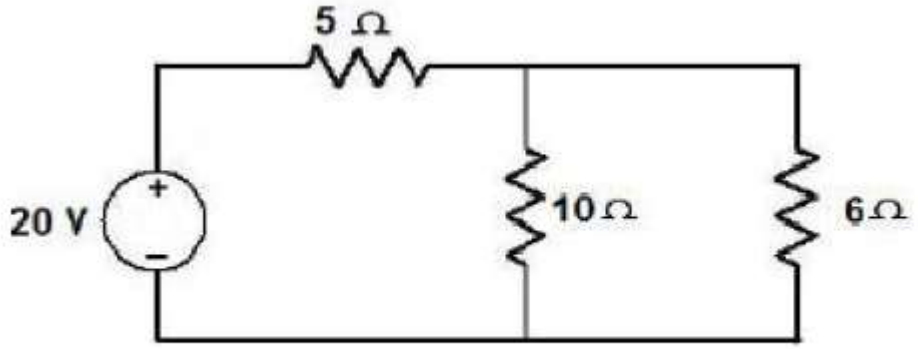
**7.** (a). Mention the limitations of Ohm's Law.

(b)For the circuit shown, use superposition theorem to compute current I.

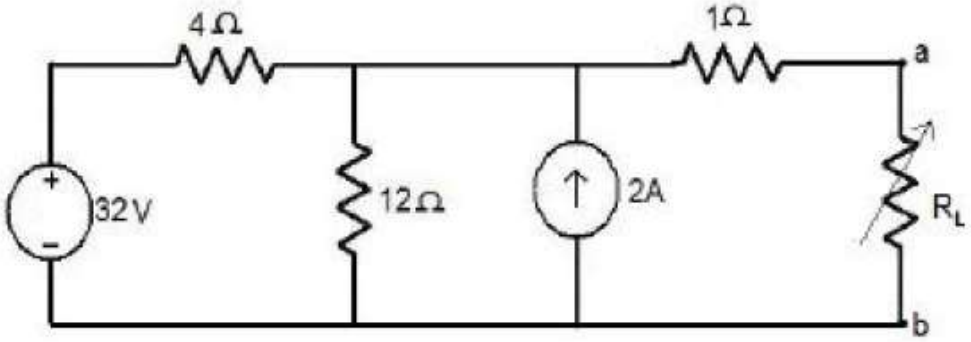


**8.(a).** Explain how voltage source with a source resistance can be converted into
an equivalent current source.

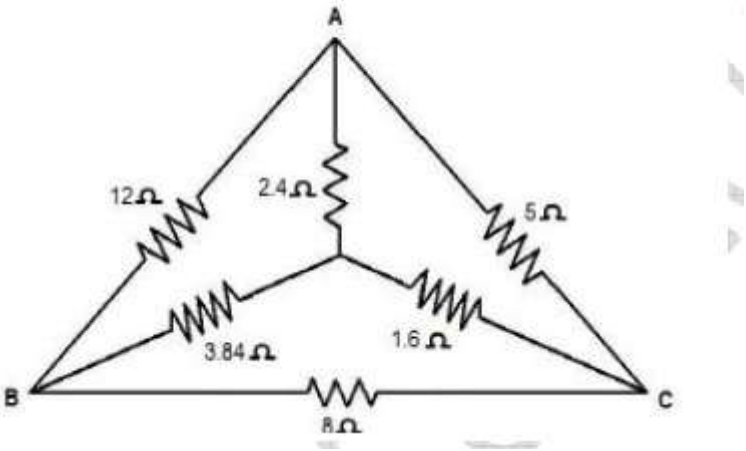
**(b).** Using Norton's theorem, find current through 6 ohm resistance shown in figure.




**9.** Find the Thevenins's equivalent circuit of the circuit shown below, to left of the terminals ab. Then find the current through RL = 16 ohm and 36 ohm.




**10.** (a) Explain the Source transformations with an example.
(b) Determine the equivalent resistance across AB of the circuit shown in the figure below.




**UNIT 3:**

**1.** Explain the R-L Series circuit and R-C Series circuit. Find the Active power, Reactive power, Reactive Power.

**2.** Explain Behavior of a pure resistor and pure inductor in an AC circuit with the help of suitable diagram.

**3.** Explain the following parameters in context with AC Circuits :

(i) Power Factor (ii) Peak value

(iii) Average value (iv) RMS value

(v) Amplitude (vi) Form Factor

(vii) Reactive powe

**4.** A coil having a resistance of 10ohm and inductance of 0.05H is connected in series with a capacitor of 100 μF and a power supply of 200volt,50 Hz. Calculate

(i) Impedance (ii) Current

(iii) Power Factor (iv) Power input

(v) Apparent power (vi) Reactive power

(vii) Sketch phasor diagram

**5.** Discuss the response of a series LCR circuit to an AC source of variable frequency. Derive the condition for resonance. Draw the resonance curve and calculate the Q of the circuit. On what parameters Q of a circuit depends?

**6.**

(a) Write the properties of Resonance of RLC series circuit, and derive its Q factor.

(b) A 220V, $100H_{Z,}$ ac source supplies a series LCR circuit with a capacitor and a coil, if the coil has 50 m Ω resistance and 5 mH inductance, find at a resonance frequency of $100H_{Z,}$ what is the value of capacitor. Also calculate the Q factor and half power frequencies of the circuit.

**7.** An inductive circuit draws 10A and 1KW from a 200V, $50H_Z$ A.C. supply. Determine:

(i) the impedance in Cartesian form (a + jb)

(ii) the impedance in polar form $Z < \theta$

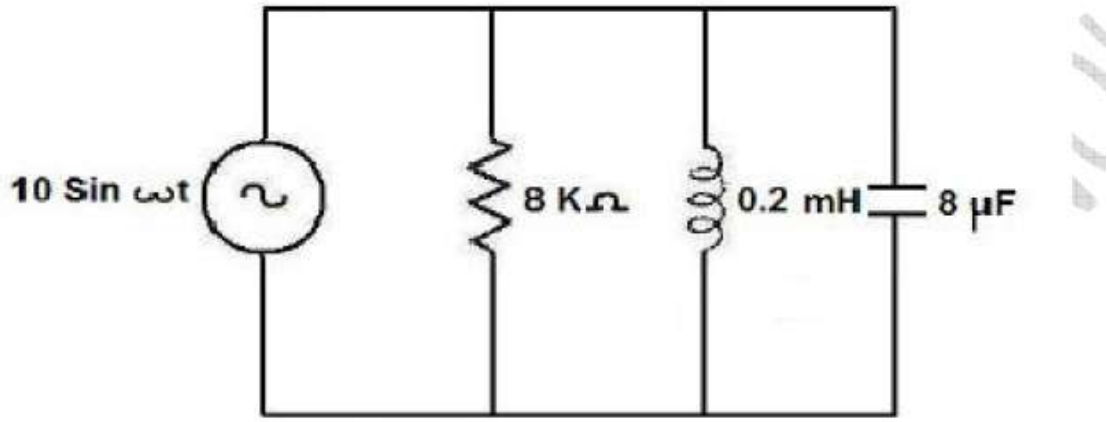
(iii) the power factor

(iv) the reactive power

(v) the apparent power

**8.** (a). What is resonance? Write the characteristics of series resonance.
(b). Determine the quality facto of a coil R = 10 ohm, L = 0.1H and C = 10Mf .

**9.** In the parallel RLC circuit, calculate resonant frequency, bandwidth, Q-factor and power dissipated at half power frequencies.




**10.(a).** What is 3-phase system? List any two advantages of 3-phase system over 1- phase system.

(b)A series RLC circuit has R=200 ohm, L=0.05H and C = 0.2 x 10-6 F. It is fed from a 100V variable frequency source. Find i) frequency at which current is maximum ii) impedance at this frequency and iii) voltage across inductance at this frequency.

## UNIT 4:

**1.** Explain the principle of $1-\phi$ transformer and draw its equivalent circuit and phase diagram in ON load and NO load condition.

**2.** Describe open circuit and short circuit test of $1-\phi$ transformer. Describe different type of losses in $1-\phi$ transformer. How the efficiency is affected with the loses?

**3.** Explain the construction and working Principle of of a Ideal and practical transformer. Also derive its e.m.f equation.

**4.** Explain Transformer Test's and Transformer Losses in brief.

**5.** a)Discuss the basic principle of transformer action. Write the relations between voltage and current at the input and output.

(b) Describe the construction of an iron core transformer. Discuss the various types of losses in transformers.

**6.** (a) Derive the EMF equation of a transformer.
(b) Explain the principle of operation of DC Machine.

**7.(a).** State Faradays laws of electromagnetic Induction?

(b). A single phase transformer has 400 primary and 1000 secondary turns. The net cross sectional area of the core is 60cm2. If the primary is connected to a 50Hz supply at 500V determine the peak value of the flux density in the core. Neglect any leakages?

**8.** Explain the working Principle of DC Machines and Describe the different Parts of DC Machines with Suitable diagram.

**9.** (a) A transformer supplied a load of 32A at 415V. If the primary voltage is 3320V,find the following:
(i).Secondary volt ampere
(ii)Primary current
(iii)Primary volt ampere. Neglect losses and magnetizing current.

**(b)**A single phase 2200/250 V, 50 Hz transformer has a net core area of 36 cm2 and maximum flux density of 6 Wb/m2. Calculate the number of primary and secondary turns.

**10.** (a) Write short note on Open Circuit and Short Circuit test of transformer.
(b)A single phase transformer has 50 primary and 1000 secondary turns. Net cross sectional area of the core is 500 cm2. If the primary winding isconnected to 50 Hz supply at 400 V, Calculate the value of maximum flux density on core and the emf induced in the secondary.

## UNIT 5:

1. (a) Draw the circuit diagram of a full wave rectifier and explain its working.

(b) Discuss the reasons for ripple in power supply outputs and how this can be reduced.

2. (a) What is difference between half wave and full wave and bridge rectifier? Derive ripple factor of full wave bridge rectifier.

(b) How the ripple factor could be reduced by use of inductor?

3. In a centre-tap full wave rectifier, the load resistance $R_L$ = 1KΩ. Each diode has forward – bias dynamic resistance $r_d$ of 10Ω. The voltage across half the secondary winding is 220 sin 314t.

Find:

(i) The peak value of the current

(ii) The d.c. or average value of current

(iii) The r.m.s. value of the current

(iv) The ripple factor and

(v) The rectification efficiency.

4.Explain the various type of filters used in power supply.

5. Write a short note on (i) bridge rectifiers,(ii) Filters and their application.

6. Design a 5 volt DC power supply from Ac 220-240 Volt. Sketch and explain the various components used.

7. (a)Derive an expression for efficiency of a half-wave rectifier.

(b) Draw the circuit diagram of a Zener diode regulated power supply and explain the regulation action.

8. (a)Derive an expression for efficiency of a Full-wave rectifier.

(b). Explain briefly the L and Π section filters and their applications.

9. (i) With thehelp of V-I characteristics describe the working principle of zener diode. What I s its symbol? Mention also the special properties of zener diode when compared to ordinary diode.

(ii) What is a half-wave rectifier? Sketch its circuit. Discuss the operation of half- wave rectifier with help of necessary waveforms.

10.Design a Zener Volage Regulator Circuit of 6.9 volt And explain with neet Diagram.

# Question Bank for B.Tech. II Sem.

# Subject: Digital Electronics DE201

## UNIT I

Q1. Prove the following equation using Boolean algebra

$BCD + A\bar{C}\bar{D} + ABD = BCD + A\bar{C}\bar{D} + AB\bar{C}$

Q2. Realize the following function using with

(i) NAND-NAND Logic

(ii) NOR-NOR Logic

$Y=\overline{AB} + B(C + D) + \bar{E}F(\bar{D} + \bar{D})$

Q3. Explain the And & Or gate with equivalent electrical circuit?

Q4.What do you mean by the Positive Negative and Mixed Logic ?

Q5. Prove the following using the Boolean algebraic theorem Type equation here.

$\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC = Ab + BC + CA$

Q6. Realize the logic expression using EX-OR gates

$Y = A \oplus B \oplus C \oplus D$

Q7. Design a logic circuit for the equation $F = \overline{A + \bar{B}C}$ . Assume A &C are asserted high while B & F are asserted low. Use only nand and nor gates?

Q8. Prove the following using the Boolean algebraic theorem

$A.B + \bar{A}.B + \bar{A}.\bar{B} = \bar{A} + B$

Q9. Simplify the Boolean equation by K-Map

$Y = (A + B + C + D)(ABCD)$

Q10. For the expression $Y = A\bar{B} + \bar{A}B$

(i) Obtain the truth table

(ii) Name the operation performed

(iii) Realize this operation using AND,OR,NOT gates

(iv) Realize this operation using NAND gates

## UNIT II

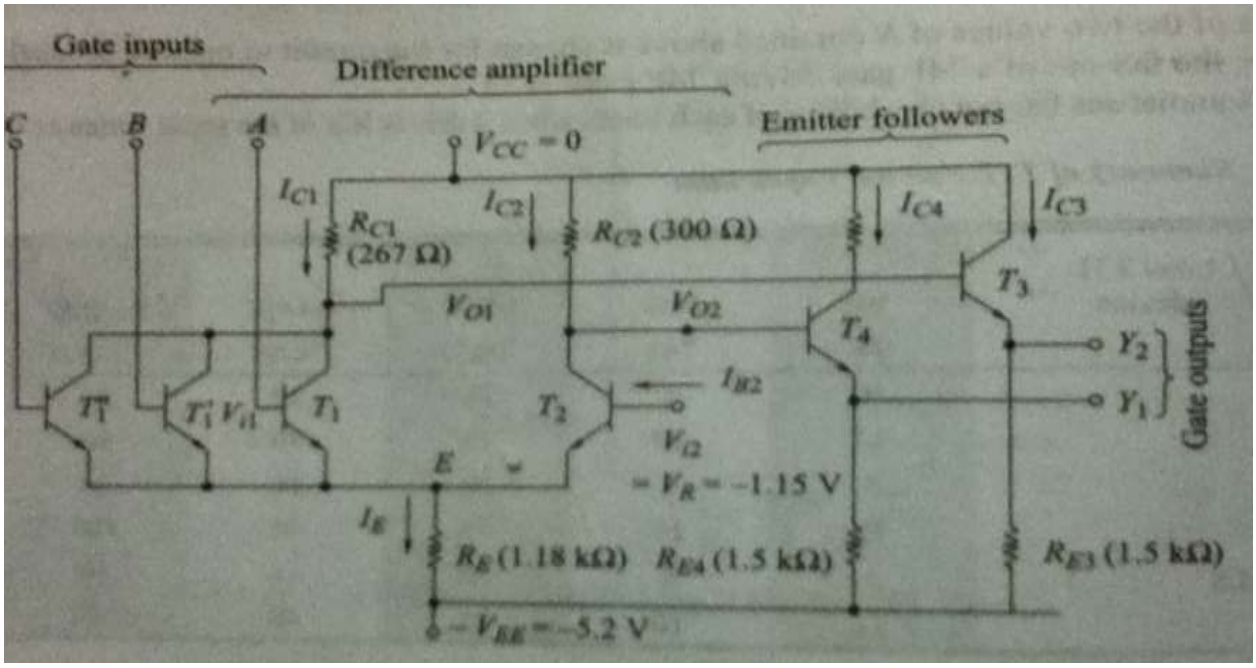
Q1. Explain the open collector TTL logic with neat clean diagram?

Q2. Explain the all characteristics of the digital IC with proper diagram?

Q3. Realize the Resistor Transistor Logic with proper diagram?

Q4. Explain the Diode Transistor Logic and how it is converted into the High Threshold Logic?

Q5. Verify that the circuit of the given figure performs OR\NOR operations



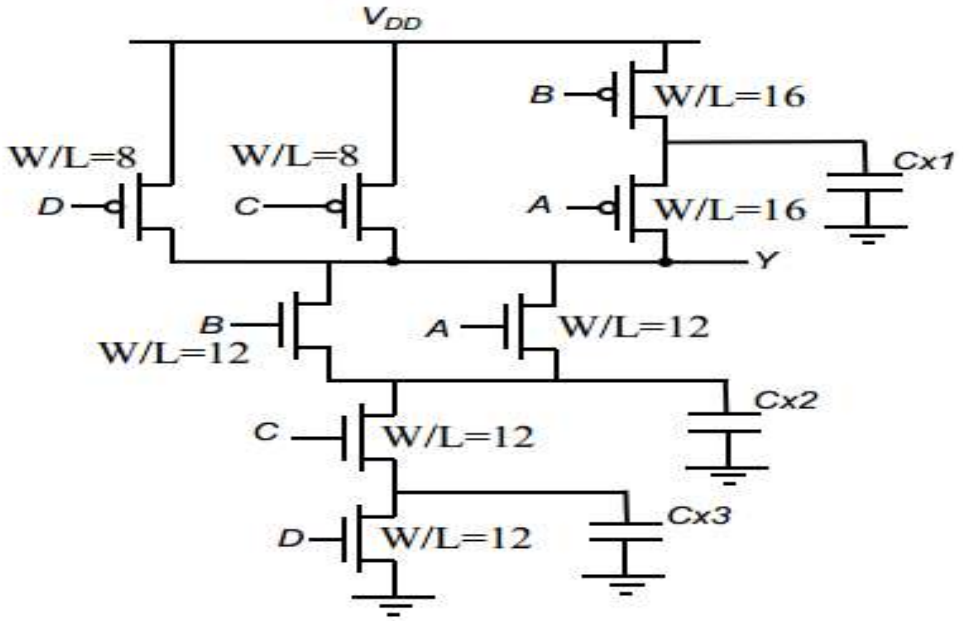

Q6. Explain with necessary diagram

(i) PMOS

(ii) NMOS

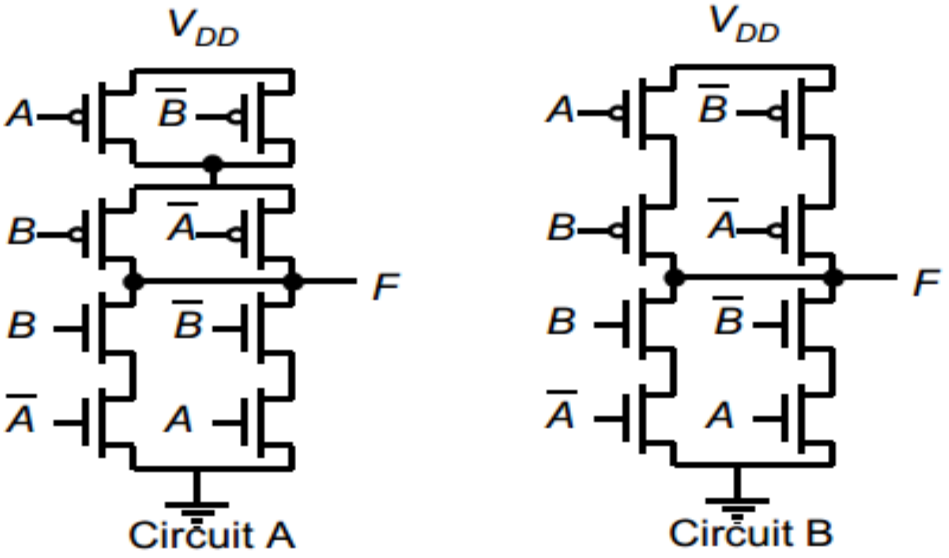
(iii) CMOS

Q7. What is the logic function implemented by the CMOS transistor network?

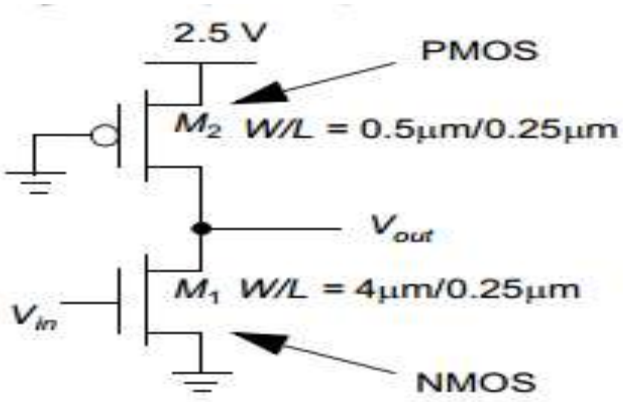



CMOS combinational logic gate.

Q8. What is the logic function if the circuit A&B? Which one is the dual network and which one is not ?




Q9. Compute the following for the NMOS inverter shown in figure $V_{OL}, V_{OH}$




Q10. What do you mean by the interfacing of the logic families explain with the help of the example?

## UNIT III

Q1. Convert the following Boolean equation into canonical sum of product

$$f(A,B,C,D) = A + B\bar{C} + AB\bar{D} + ABCD$$

Q2. Minimize the four variable logic function by K-map

$$F(A,B,C,D) = (A + B + \bar{C} + \bar{D}).(\bar{B} + C).(\bar{A} + C + \bar{D}).(\bar{A} + B + \bar{C} + \bar{D}).(\bar{B} + \bar{C}).(A + \bar{B}).(\bar{B} + \bar{D})$$

Q3. . Find the minimal sum of products for the Boolean expression, using the Quine-McCluskey method

$$F = \Sigma(1,2,3,7,8,9,10,11,14,15)$$

Q4. Simplify the Boolean equation by K-Map

$$Y = (A + B + C + D)(ABCD)$$

Q5. Convert the following in to the standard SOP form

(a) $f(ABDC) = A\bar{B}C + \bar{A}\bar{B} + AB\bar{C}D$

(b $f(WXYZ) = W\bar{X}Y + \bar{X}Y\bar{Z} + WX\bar{Y}$ )

Q6. Simplify the logic function of the given equation using Quine-McCluskey minimization technique

$$Y(A,B,C,D) = \Sigma m(0,1,3,7,8,9,11,15)$$

Q7. Simplify the logic function of the given equation using Quine-McCluskey minimization technique

$$f(A,B,C,D) = \Sigma m(1,3,7,11,15) + d(0,2,5)$$

Q8. Design the Binary to Gray Convertor?

Q9. Minimize the logic function in POS form

$$f(A,B,C,D) = \Pi M(4,6,10,12,13,15)$$

Q10. Minimize the logic function by K map

$$f(A,B,C,D) = \Sigma m(0,1,2,3,5,7,8,9,11,14)$$

## UNIT IV

Q1. Explain the Half and Full adder with neat and clean diagram?

Q2. Explain the working of the binary and parallel adder with proper diagrams?

Q3. Implement the expression using the multiplexer

$$f(A,B,C,D) = \Sigma m(0,2,6,8,9,12,14)$$

Q3. Design an octal to binary converter?

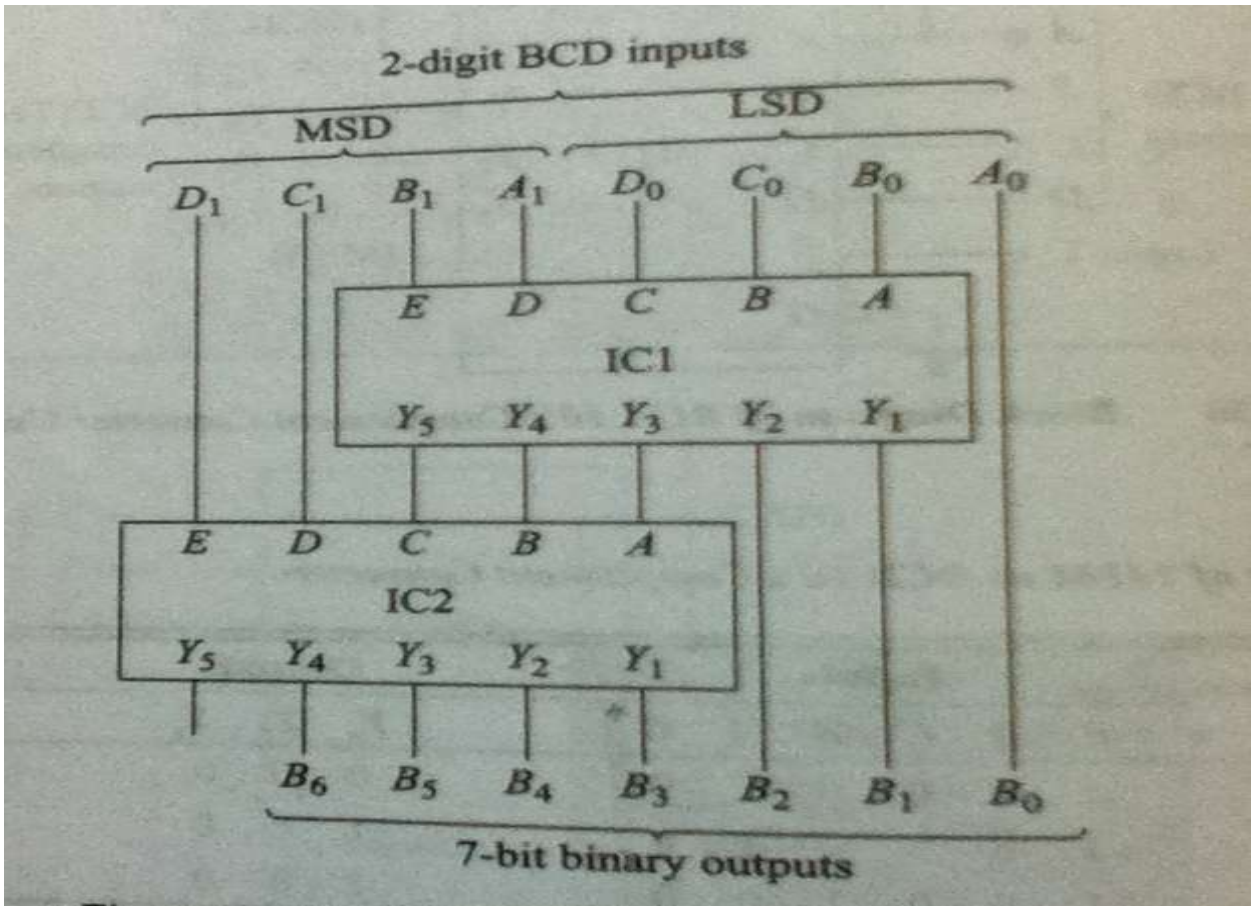
Q4. Explain the diode switch matrix?

Q5. Design an BCD to 7 segment decoder?

Q6. Show how addition of the two digit 1001,1110 os done by the BCD adder step by step?

Q7. Design the logic circuit of the multiplexer ?

Q8. Verify the operation of a 2-decade BCD to binary converter of figure for input 29?




Q9. Explain the Full Sub tractor?

Q10. Explain the encoder and decoder with neat diagram?

## UNIT V

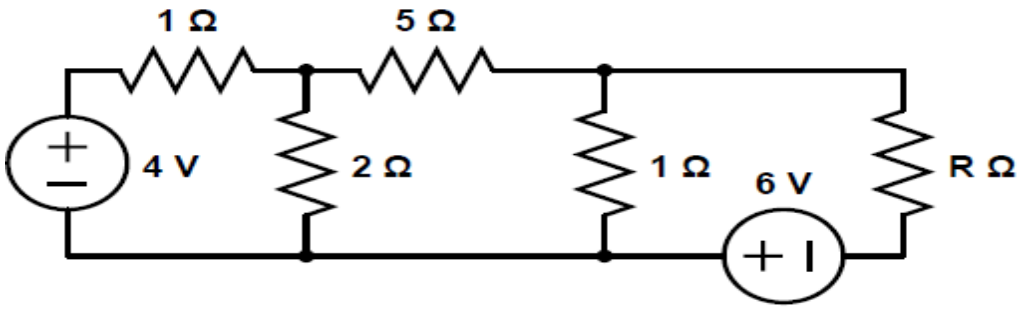
Q1. Explain the RS flip flop and explain the forbidden condition?
Q2. Design an D Flip Flop?
Q3. Explain the JK flip flop and how the race around condition is solved?
Q4. Explain the mod 4 counter?
Q5. Design an mod 10 counter?
Q6. Draw the state diagram of the JK flip flop ?
Q7. Explain the ring counter ?
Q8. Explain the operation of the ring counter and give its state diagram?
Q9. How the skipping state counter works explain in detail?
Q10. Design an ripple counter using an flip flops divided by 5?

# Question Bank for B.Tech. III Sem. End-Term Examination, 2014
# Subject: Circuit Analysis and Synthesis (EC 302)

## UNIT – 1

1 a) State and explain the Tellegen's theorem.

b) Find the value of R in the following circuit such that maximum power transfer takes place. And also find the amount of this power.

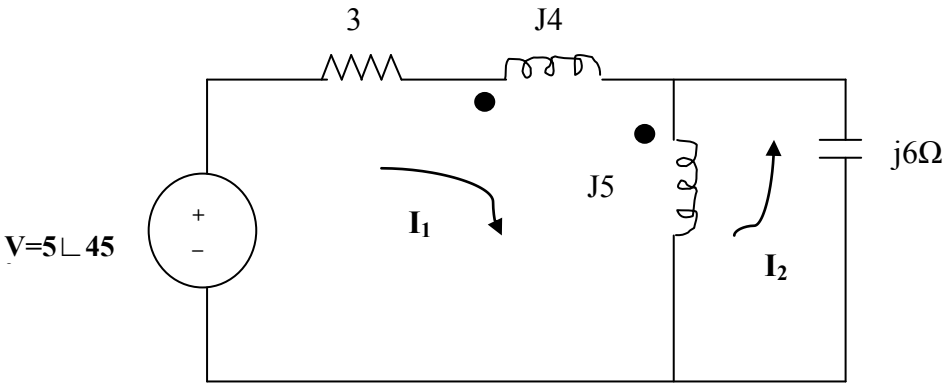



2 a) Explain conductivity coupled equivalent circuit with suitable example.

b) Derive the mesh equations for parallel magnetic coupled circuits and draw equivalent circuit.

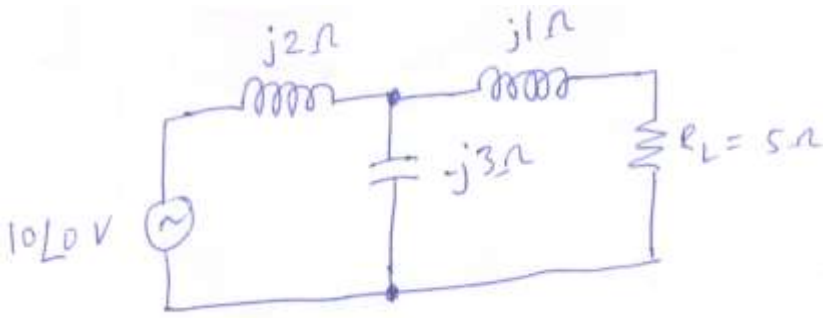
3 (a) Derive the relation for Maximum power transfer theorem.

(b) Find drop across the capacitor and the resistor



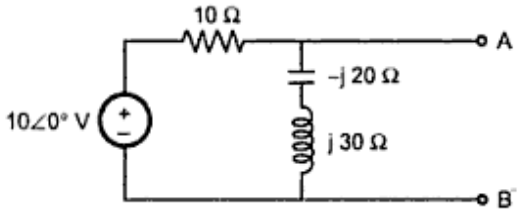
4 (a) On what factors does the coefficient of coupling depend? If k is the coefficient of coupling; M – mutual inductance and L1 and L2 are the self inductances; show that $M = k\sqrt{L1\ L2}$ ; $0 \leq K \leq 1$

(b) Find the drop across the resistance in the circuit given below.

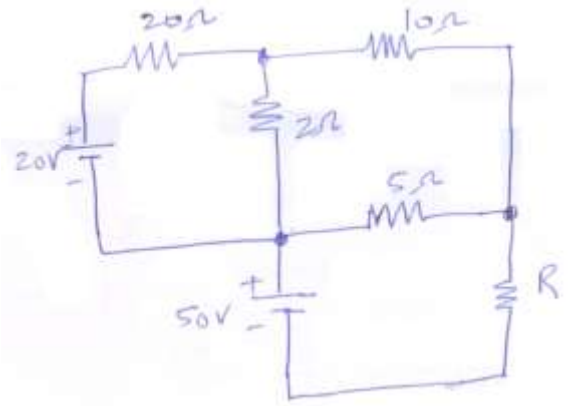



**5** (a) State and Prove Miller's Theorem

(b) Determine the impedance to be connected across AB for maximum power transfer in circuit given below. Calculate the amount of power transferred in this condition.



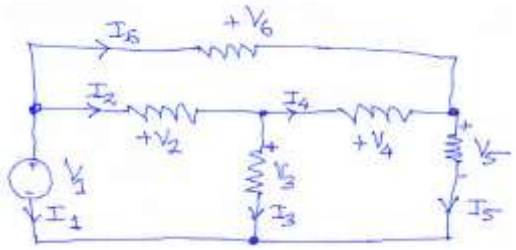

6 What is the value of R such their maximum power transfer takes place from the sources to R in the circuit of figure. Also, determine the amount of maximum power.



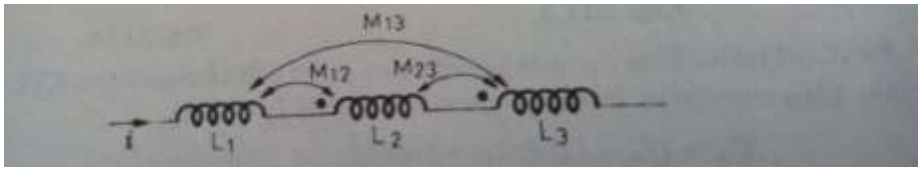

7 (a) Check the validity of Tellegen's theorem in the following Circuit.

$V_1 = 8V, V_2 = 4V, V_4 = 2V$

$I_1 = 4A, I_2 = 2A, I_3 = 1A$

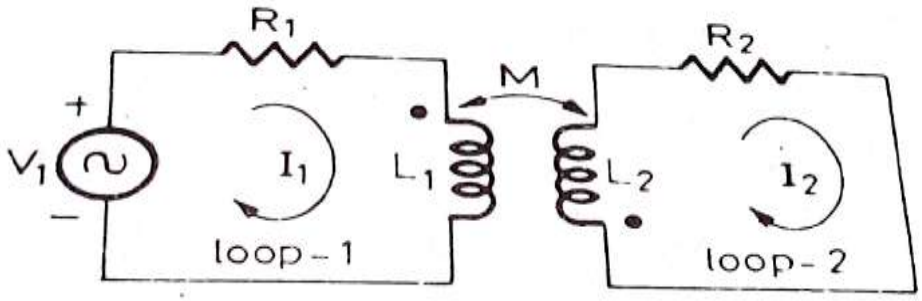



(b) Find the total inductance of series connected couple coil.




8 (a) Derive the relation for total inductance in Series coupled circuit.

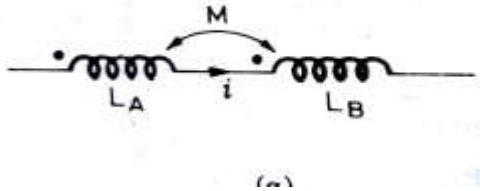
(b) Write down Voltage equation for given

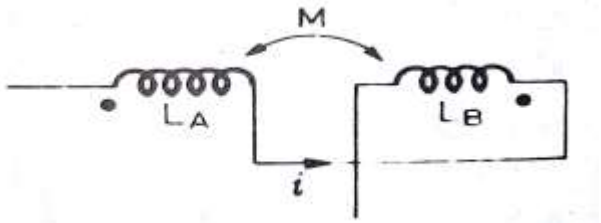



circuit

9 (a) Two coupled coils have self-inductance L1=10 X $10^{3}$H and L2= 20 X $10^{-3}$H. The coefficient of coupling (K) being 0.75 in the air, find voltage in the second coil and flux of first coil provided the second coil has 500 turns and the circuit current is given by i1=2sin(314t).

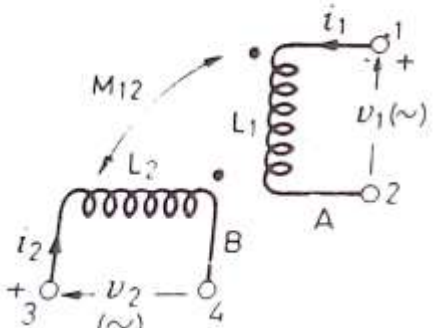
(b) Find the expression for the mutual inductance in the given figure.

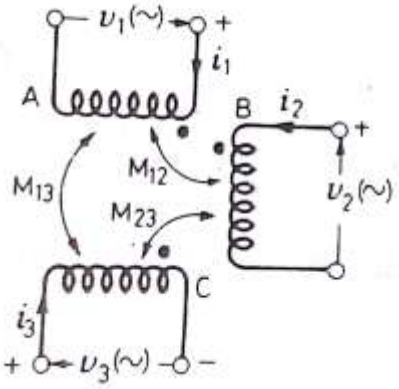



10 Find total inductance of coupling circuit given below.

(a)


$i_1$
1
+
$M_{12}$
$L_1$
$v_1(\sim)$
$L_2$
2
A
$i_2$
B
+
3
$v_2$
4


$v_1(\sim)$
+
$i_1$
A
B
$i_2$
+
$M_{13}$
$M_{12}$
$v_2(\sim)$
$M_{23}$
C
$i_3$
+
$v_3(\sim)$
–

**UNIT – 2**

1 a) Write the necessary conditions for Transfer Function.

b) Check the stability of following characteristic equation.

(i) $2S^5 + S^4 + 6S^3 + 3S^2 + S + 1 = 0$

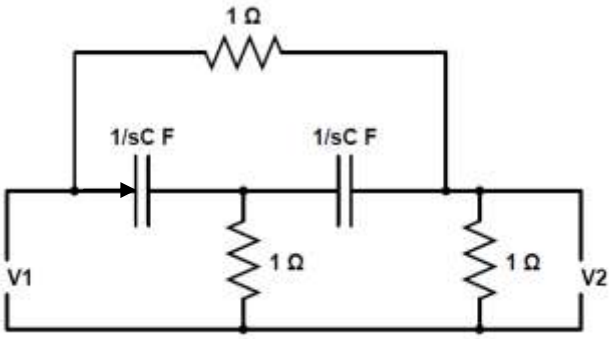
(ii) $S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$

2 a) Determine the range of K for which the system given by following characteristic equation is stable.

(i) $S^3 + 7S^2 + 10S + 10K = 0$

(ii) $S^4 + S^3 + KS^2 + S + 1 = 0$

b) For given figure calculate driving point Impedance $Z_{11}(s)$, Transfer Impedance $Z_{21}(s)$.




3 (a) Write the restriction on location of poles and zeros in driving point function.

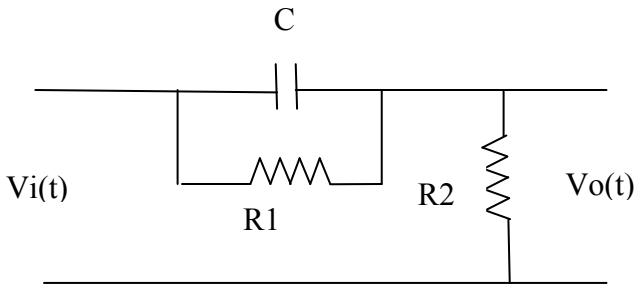
(b) Check the stability of the system having following characteristic equation

$S^5+2S^4+24S^3+48S^2 - 25S-50=0$

4 (a) Determine the range of K for which the system given by following characteristic equation is stable. (6) (i) $S^4+20KS^3+5S^2+10S+15=0$

(ii) $S^4+S^3+KS^2+S+1=0$

(b) Determine $V_o(s)/ V_i(s)$ for the network shown in figure.



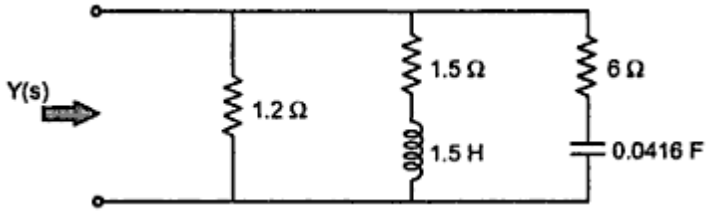

5 State and explain Hurwitz criterion of stability and check the stability of the following polynomial by applying Routh Hurwitz criterion.

$$s^5 + 2s^4 + 24s^3 + 48s^2 + 25s + 50 = 0$$

6 (a) Define driving point impedance, driving point admittance, transfer impedance and transfer admittance. How are they related?

(b) A series R-C circuit is in parallel with an inductance L. Find the input impedance in Laplace domain.

7 (a) Calculate transform admittance of circuit shown below:



(b) Determine the stability of a system having following characteristics equation

$$S^4 + 10S^3 + 35S^2 + 50S + 24 = 0$$

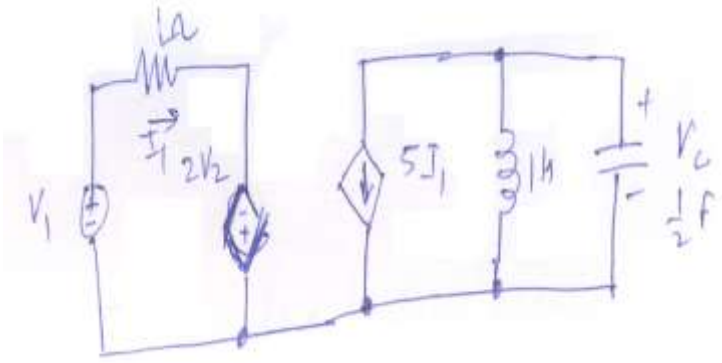
8 (a) Check whether given function is Hurwitz or not.

(i) $P(s) = S^4 + 7s^3 + s^2 + 18s + 6$

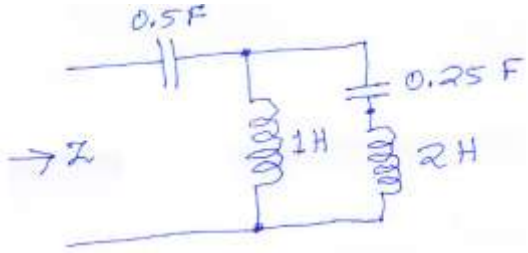
(ii) $P(s) = s^3 + 4s^2 + 2s + 8$

(b) State and explain restrictions on the locations of poles and zeros in the driving point functions.

9 In the network of figure below, find the pole-zero plot.




10 (a) Find the driving point admittance of the following network.




(b) Explain the Hurwitz stability criteria of characteristic equation with an example.

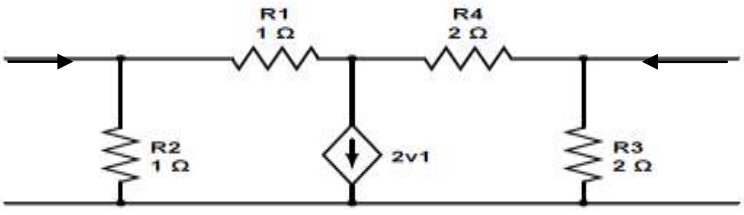
## UNIT – 3

1 a) Derive the relation for following two port Networks.

(i) Series connection

(ii) Cascade connection

b) Obtain the Z parameter for following circuit

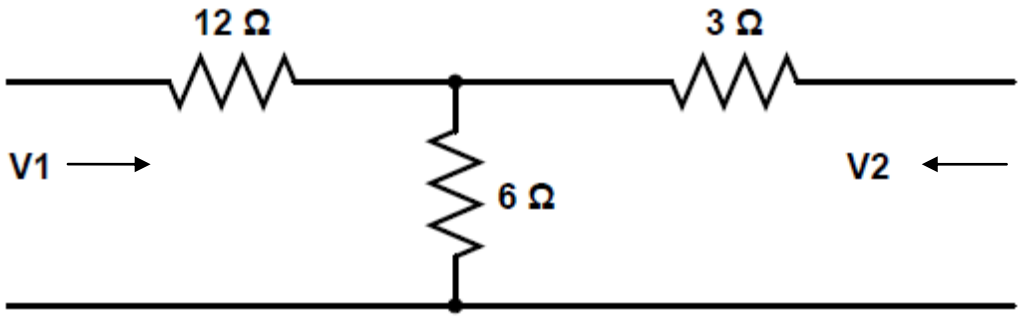



2 a) Convert the following.

(i) Z parameter to Y parameter

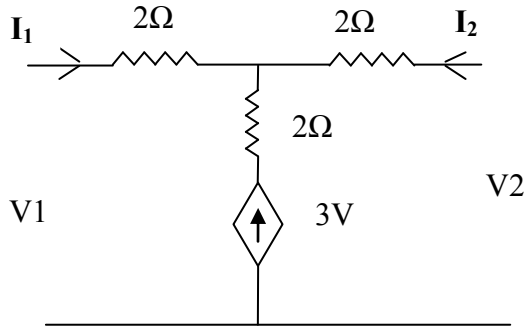
(ii) ABCD parameter to h parameter

b) Determine the h parameter for following figure.




3 (a) Derive the condition of reciprocity and symmetry in two port network for ABCD parameter.

(b) Find Y parameter of the network shown below.

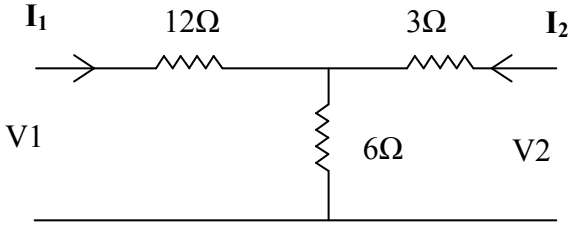



4 (a) Convert the following. (6)

(i) ABCD parameter into Z parameter

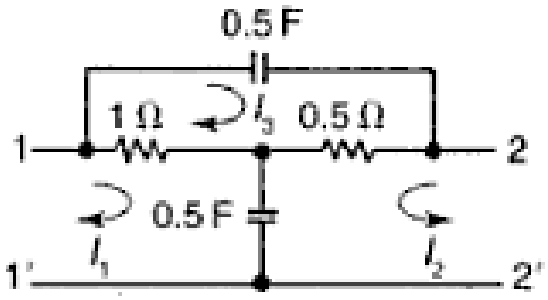
(ii) Z parameter into Y parameter

(b) Determine the h parameter for T network shown in given figure



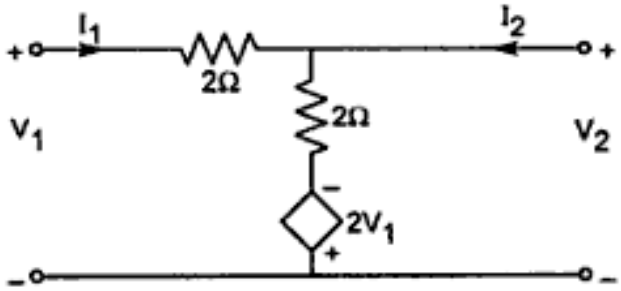
5 (a) Derive the relation for series parallel connection of two port network.

(b) Obtain Z parameters of the circuit shown below. Find its equivalent circuit using Z parameters



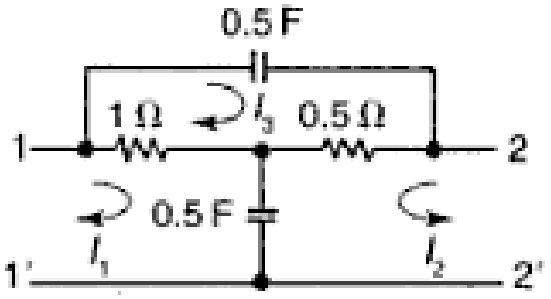

6 (a) Derive a relation for Cascade connection of two port networks.

(b) Find T and ABCD parameters of network shown below:



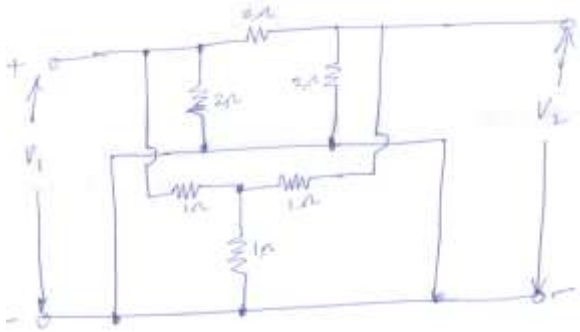

7 (a) Find y parameters in terms of transmission parameters for a two port network 7 Marks

(b) Obtain Y parameters of the circuit shown below. Design its equivalent circuit using y parameters

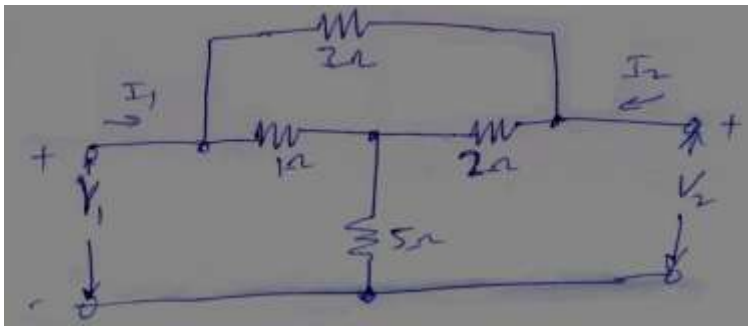



8 (a) Derive relation for parallel connection of two port network.

(b) Find the y – parameters for the network shown in figure below:

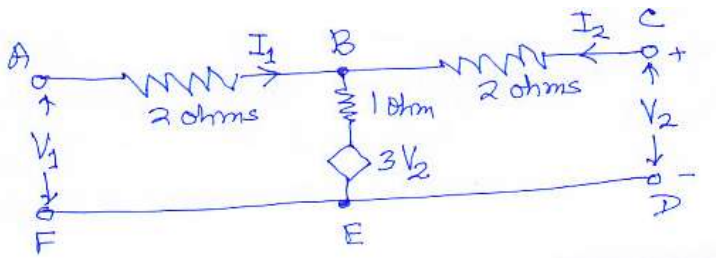


9 (a) Obtain the open circuit parameters and loop equations of the network shown in figure below:




(b) Find the condition of reciprocity and symmetry ABCD parameter representation of two port networks.

10 (a) Find theY parameter for the following network.



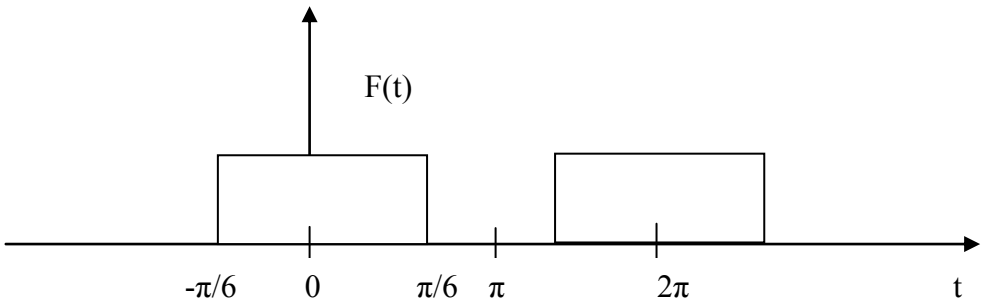

(b) Find the condition of reciprocity and symmetry Z parameter.

## UNIT – 4

1 a) Find the transient response of series RL and RC circuits with DC excitation.

b) Find the current in a series R-L circuit having R=2 Ω and L=10H when a DC voltage of 100V is applied. What is the value of this current after 5 sec. of switching on?

2 a) Obtain Fourier series of the waveform shown below



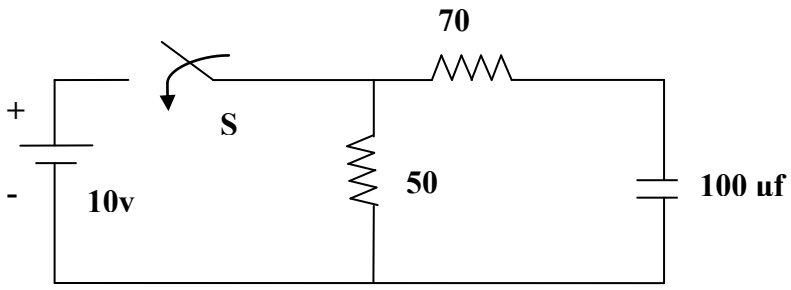

b) Find the initial value f(0+)

$$(i)\quad F(s)=\frac{2(s+1)}{s^2+2s+5}$$

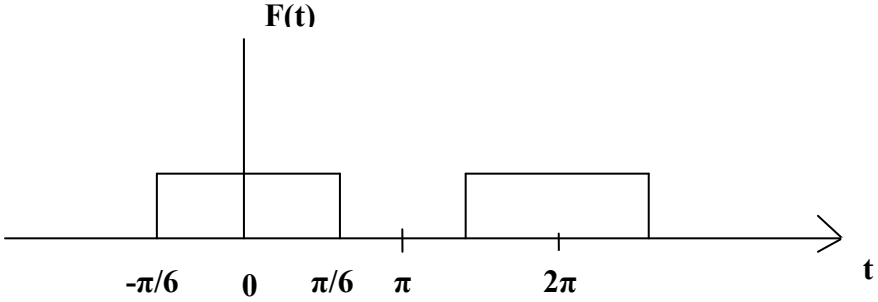
$$(ii)\quad f(t)=9-2e^{-5t}$$

3 (a) Find the transient response of series RLC circuits with DC excitation.

(b) In the figure given below switch S is closed. Find the time when the current from battery reaches to 500 mA. (8)



4 (a) Obtain Fourier series of the waveform as in figure shown below



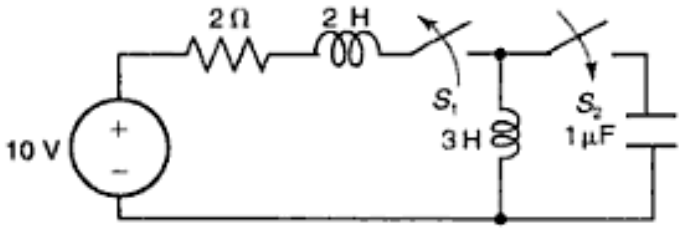

(b) Determine initial and final values of current where .

$$I(s) = \frac{0.42}{s\,(s^2 + 0.35s + 0.816)}$$

5 (a) Find the transient response of Series R-L circuit with DC excitation.

(b) Find the transient response of R-C circuit with sinusoidal excitation.

6 Determine the growth of voltage across capacitor when switch S1 is opened and S2 are closed at t = 0.




7 (a) Find the transient response of

(i) Series R-L circuit (ii) Series R-C circuit

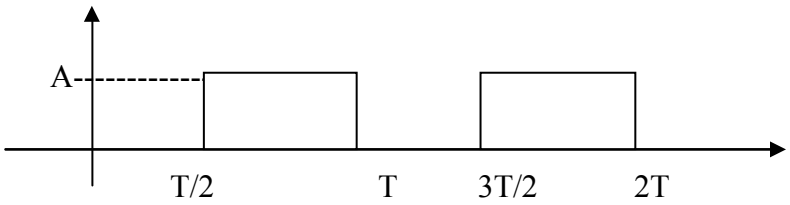
(iii) Series R-L-C circuit with DC input

8 (a) Find initial and final values of the following functions

(i) $F(S) = \dfrac{(S+3)(S+7)}{(S+2)(S+5)}$

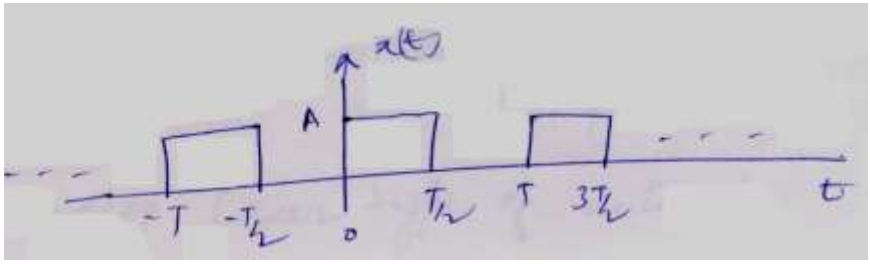
(ii) $F(S) = \dfrac{S^2 + 5S + 7}{(S^2 + 3S + 2)}$

(b) Find the Fourier series of the wave form shown in figure.

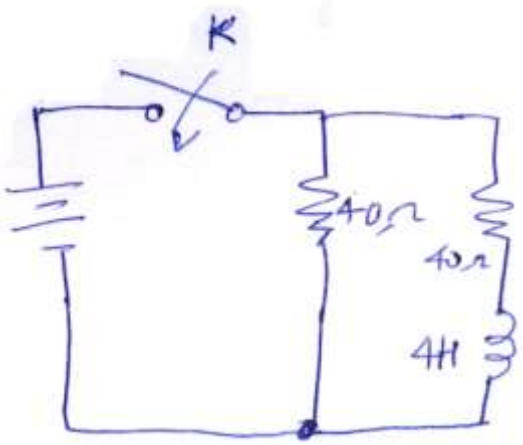



9 (a) Explain the average and RMS power in a circuit.

(b) Determine the Fourier series of the wave shown in figure.




10 (a) In the figure, steady state condition in reached with 100V d.c. source. At t = 0, switch K is suddenly opened. Find the expression of current through the inductor after t = ½ seconds.




(b) Explain power factor and complex power.

11 Find the transient response of

(a) Parallel R-L circuit with DC excitation

(b) Parallel R-C circuit with DC excitation.

**UNIT – 5**

1 a) An Impedance function is given by

$$Z(S) = \frac{(S+1)(S+4)}{S(S+2)(S+5)}$$

Find the R-C representation of Foster I and II forms.

b) Write the necessary conditions for R-C Impedance or R-L admittance function

2 (a) Synthesis the network as Causer – I form.

$$Z(S) = \frac{S^5 + 5S^3 + 4S}{S^4 + 3S^2 + 1}$$

b) Synthesis the network as Foster – II form

$$Z(S) = \frac{S(S^2+4)(S^2+25)}{S(S^2+16)}$$

3 (a) Write down necessary condition for R-C admittance function or R-L impedance function.

(b) Obtain foster II form of

$$\mathbf{Z(s)} \quad \frac{\mathbf{s^3+4}}{\mathbf{(s^2+1)(s^2+9}}$$

4 Diagnose whether following impedance function represents a RL or RC network and find its Cauers I and II form

$$\mathbf{Z(s)} \quad \frac{\mathbf{s\,(s+2)(s+4)}}{\mathbf{(s+1)(s+3)}}$$

5 The driving point impedance of a reactive network is given by:

$$z(s) = \frac{2\,(s^2+1)\,(s^2+3)}{s\,(s^2+2)}$$

Develop Cauer Iand II type of network.

6 (a) Write down necessary condition for LC impedance function.

(b) Diagnose whether the following impedance function represents a RL or RC network and find its Cauer form.

$$Z(s) = \frac{4\left(s^2+1\right)\left(s^2+9\right)}{s\left(s^2+4\right)}$$

7 checks given function is RC or RL impedance function and Synthesize the following function using Cauers I and II form.

$$Z(s) = \frac{s\left(s^2+2\right)\left(s^2+5\right)}{\left(s^2+1\right)\left(s^2+3\right)}$$

8. Driving point impedance is given below obtain the Fosters I and II form.

$$Z(s) = \frac{10\left(s^2+4\right)\left(s^2+16\right)}{s\left(s^2+9\right)}$$

9 The driving point impedances of a one port reactive network is given by:

$$z(s) = 4\,\frac{s\,(s^2+4)}{(s^2+1)\;(s^2+16)}$$

Obtain the foster forms of LC network realization.

10 The driving point impedance of a reactive network is given by:

$$z(s) = \frac{2\,(s^2+1)\,(s^2+3)}{s\,(s^2+2)}$$

Develop cauer I and II type of network.

# Question Bank for B.Tech. V Sem. End-Term Examination, 2014

## Subject: Analog Electronics (EC303/CS305/EE401)

UNIT I

Q1. Explain the Construction & Characteristics of the JFET?

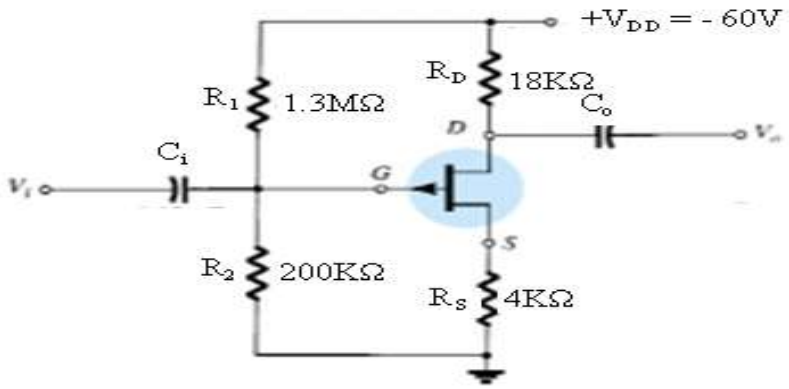
Q2. Prove that $g_m = g_{mo}(1-V_{GS}/V_p)$ by Small Signal Model of the FET and explain in detail

FET as voltage variable Resistor?

Q3.For p channel JFET as shown in given figure , if $I_{DSS}$ = 4mA and $V_p$ =4 volts, calculate

following values.

(i) $I_D$, (ii) $V_{GS}$, (iii) $V_{DS}$




Q4. Write down the advantages and disadvantages of FET over conventional transistor. Also

explain operation of N-Channel FET with it's diagram.

Q5. Explain the working of FET as VVR with is diagram.

Q6. Classify the FET types. Also explain working of N-Channel enhancement MOSFET.

Q7. Explain the PUT with proper diagram?

Q8. Calculate the minimum value of $V_{DS}$ required for an N – MOSFET to operate in the pinch-

off when $V_{GS}$ =1V with $V_p$ = -2V, and $I_{DSS}$=10mA. What would be the corresponding value

of $I_D$ ?

Q9. Calculate the drain current of an nMOS transistor for $V_{GS}$ = 0V, 1V, and 2V with the

Devices parameters as W=5$\mu m$, L=1 $\mu m$ , $V_{DS}$ =0.1V , $V_{th}$ = 1V, $\mu nCox = 25\mu A/V^2$ ?

Q10. Obtain the voltage that will appear at the source neglecting the effect of $V_{DS}$ on $I_D$ in

Case of a depletion-type nMOS transistor shown in figure having $V_{th}$ = -2V and $\mu_n C_{OX} \frac{W}{L} = 4\ mA/V^2$ ?

UNIT II

Q1. Classify all the Feedback amplifiers with proper diagrams?

Q2. What do you mean by the negative feedback and how it effects the gain, noise & distortion?

Q3. Compare the voltage series and current series feedback amplifier?

Q4. Compare the voltage stunt and current feedback combination in detail?

Q5. How does the feedback affect the stability?

Q6. When negative voltage feedback is applied to an amplifier of gain 100, the overall gain fall

to 50

a. Calculate the fraction of the output voltage feedback.
b. If this fraction is maintained, calculated the value of the amplifier gain required if the overall stage gain is to be 75.

Q7. An amplifier has a voltage amplification $A_v$ and a fraction $m_v$ of its output is feedback in

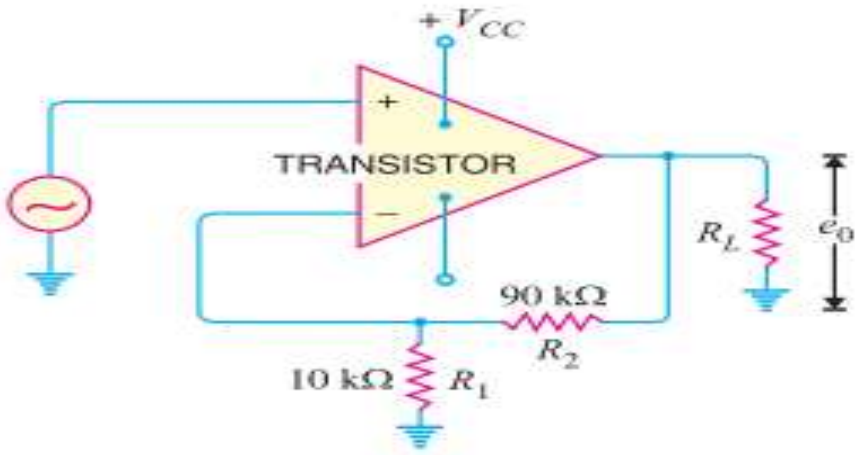
Opposition to the input. If $m_v$ =0.1 and $A_v$ = 100, calculate the percentage change in the gain

of the system if $A_v$ falls 6db due to ageing?

Q8. figure shows the circuit of a negative voltage feedback amplifier. If without feedback,

$A_v$=10,000, $Z_{in}$ = 10K ohm, $Z_{out}$ = 100 ohm find:

a. Feedback
b. Gain with feedback
c. Input impedance with feedback
d. Output impedance with feedback




Q9. An amplifier has a gain of 1000 without feedback and cut-off frequencies are $f_1$=1.5kHz

And $f_2$ = 501.5kHz. If 1% of output voltage of the amplifier as negative feedback, what are

the cut-off frequencies?

Q10. What are the characteristics of the negative feedback and why it is better than the positive

Feedback?

UNIT III

Q1. Explain the Direct Coupled amplifiers in detail and miller's theorem with example?

Q2. What do you mean by Hybrid pi model of transistor derived its all conductance?

Q3. Derive all the hybrid π conductance of the transistor, A BJT has following low frequency h

parameter Ic=8mA, $h_{ie}$=2KΩ, $h_{re}$ = $10^{-5}$, $h_{fe}$=100 , $h_{oe}$=5*$10^{-6}$ mho , find all resistive

Parameter for hybrid π Model?

Q4. What do you mean by the Direct Coupled amplifier explain it with proper diagram?

Q5. The overall gain of a multistage amplifier is 140. When negative voltage feedback

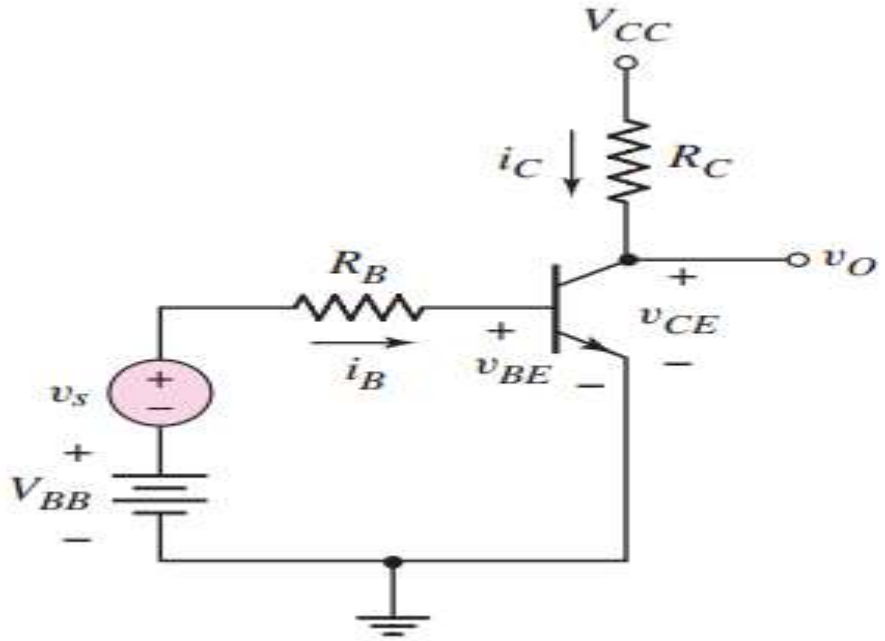
is applied, the gain is reduced to 17.5. Find the fraction of the output that if feedback

to the input?

Q6. What do you mean by the miller's theorem and explain the effect of cascading on gain of an

Amplifier?

Q7. The circuit parameters in figure are Vcc =5V, $V_{BB}$ = 2V, $R_B$=650kohm. The parameters are $\beta$=100 and $V_{BE}$(on)= 0.7v.




a. Determine the Q point values Icq and Vceq
b. Find th small signal hybrid-$\pi$ parameters $g_m$
c. Calculate the small signal voltage gain .

Q8. Determine the small signal voltage gain and input resistance of a common emitter circuit with an emitter resistor for the given figure the transistor parameters are

a. $\beta$=100
b. $V_{BE}$(on)= 0.7v.
c. $V_A = \infty$

Q9. Derive all the conductance of the hybrid pi model?

Q10. Derive all the capacitances of the hybrid pi model?

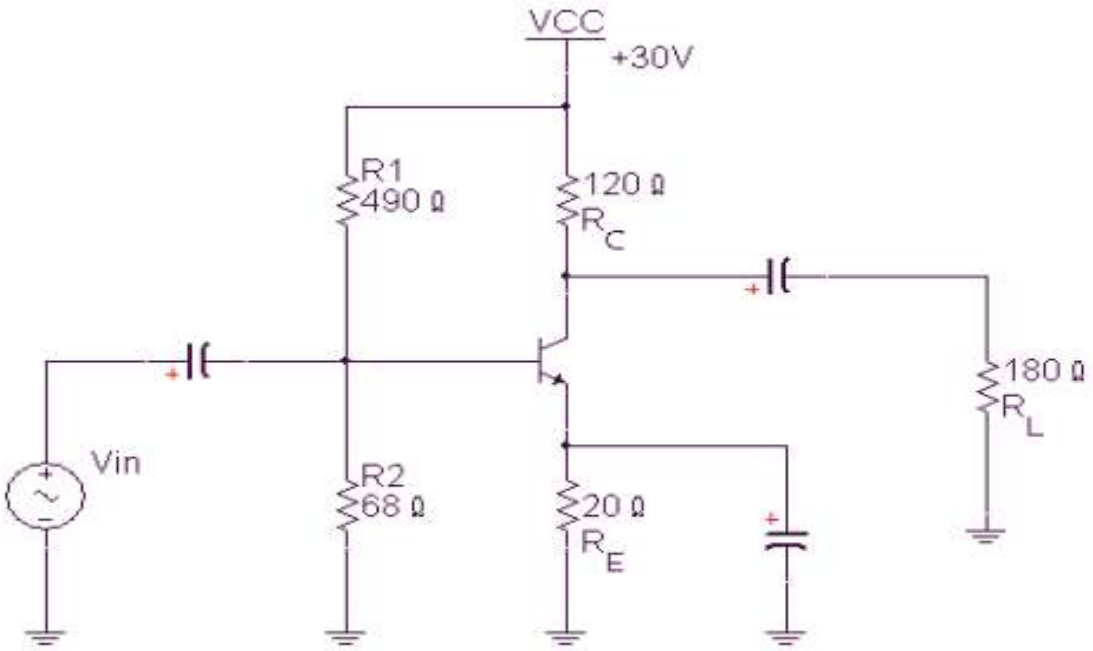
UNIT IV

Q1. What is the basic principal of the power amplifier explain it by proper example?

Q2. Classify all the category of the power amplifier with the help of the load line concept?

Q3. Determine the ac load line saturation and cutoff points in figure , also find the maximum

peak to peak output voltage.

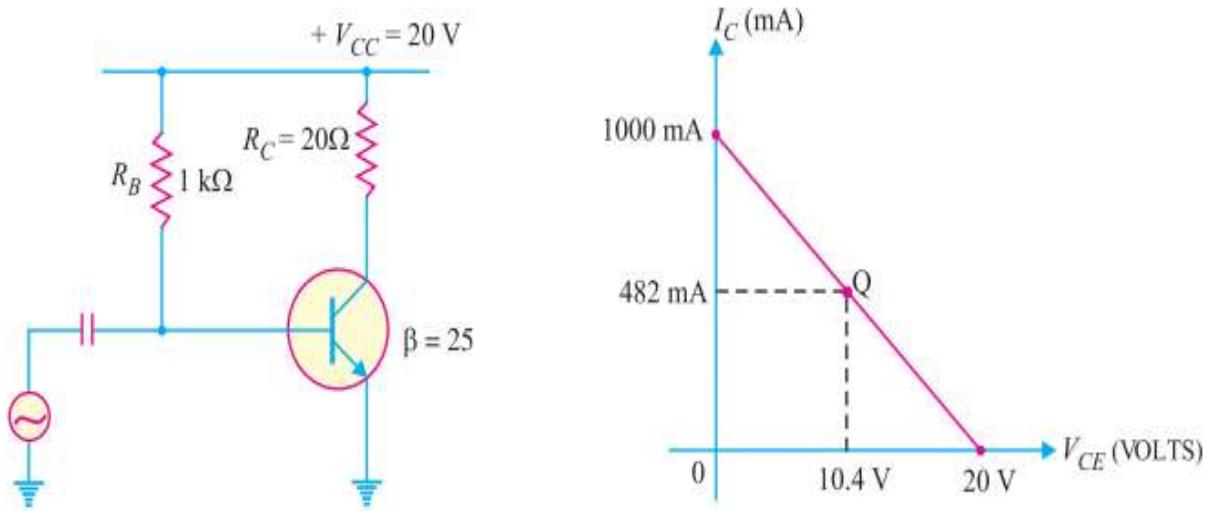



Q4. Explain the class A power amplifier and show that the using the transformer we can increase the efficiency of the transformer?

Q5. Explain the Class B amplifier and show the how we eliminates the cross over distortion?

Q6. It is given that input voltage results in a base current of 10mA peak , than calculate the

a. Output power
b. Input power
c. Collector efficiency of the amplifier circuit shown in the figure




Q7. Explain the complementary symmetry amplifier in detail?

Q8. A power transistor has thermal resistance $\theta = 300°C/W$. If tha maximum junction temperature Is $90°C$ and the ambient temperature is $30°C$, find the maximum permissible power dissipation, and if the heat sink is used with the above transistor, the value of $\theta$is reduced to $60°C/W$ then find out the maximum permissible power dissipation?

Q9. A class B push pull amplifier with transformer coupled load uses two transistors rated 10W each. What is the maximum power output one can obtain at the load from the circuit?

Q10. Explain the Quasi complimentary symmetry amplifiers using MOSFET?

UNIT V

Q1. Explain the Parallel resonant circuit in detail?

Q2. A parallel resonant circuit has a capacitor of $250pF$ in one branch and inductance of

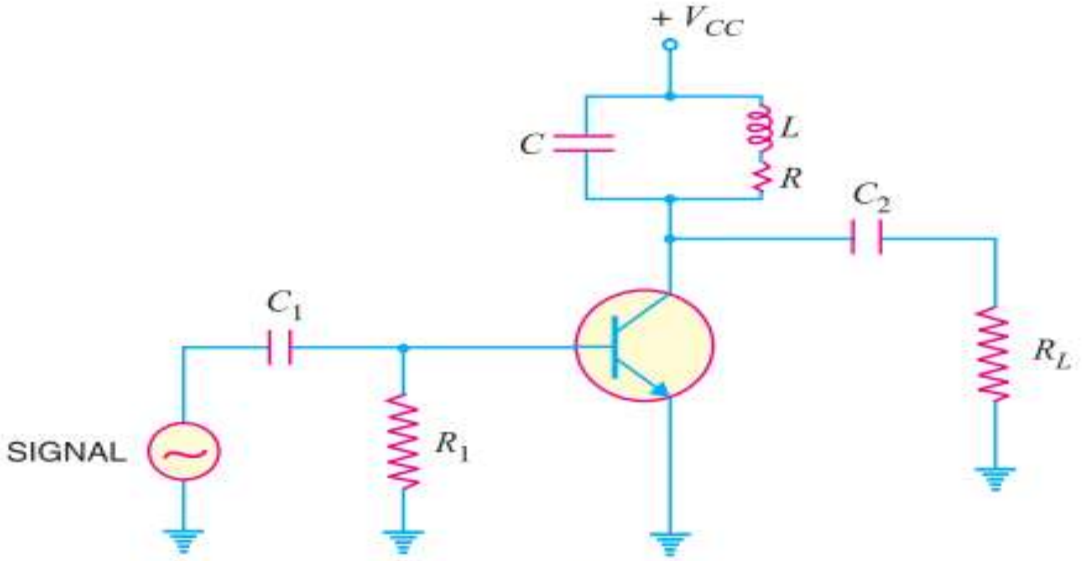
$1.25mH$ plus a resistance of 10ohm in the parallel branch then find.

a. Resonant frequency.
b. Impedance of the circuit at resonance.
c. Q-factor of the circuit.

Q3. The Q of a tuned amplifier is 60. If the resonant frequency of 2MHz and the bandwidth
is 50kHz. Find the Q factor & draw the frequency response of an in deal tuned amplifier
and discuss its characteristics.

Q4. In the circuit shown figure C=500pF and the coil has L=50.7$\mu H$ and R= 10ohm $R_L$= 1 M
ohm.

a. The resonant frequency.
b. D.c. load and a.c. load.




Q5. Explain the stagger tuned amplifier with neat and clean diagram?

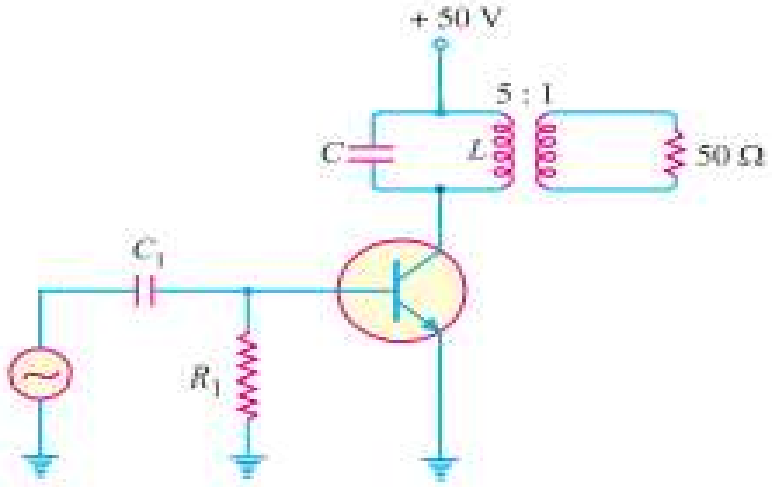
Q6. What do you mean by the neutralization techniques of the band pass amplifier and
discuss two of them?

Q7. Explain the class C tuned amplifier and explain their application?

Q8. Explained the double tuned amplifier with neat and clean diagram?

Q9. Calculate the following from the given figure

a. A.c. load
b. Maximum load power in the circuit




Q10. Why are tuned circuits not used for low frequency application & how is Q effect

on the resonance curve

# Question Bank for B.Tech. III Sem. End-Term Examination, 2014

# Subject: EMI (EC-305, ME-305, EE-304, EV305)

## UNIT-1

Q1 Define the terms accuracy, precision, resolution, expected value, average value.
Q2 State the three major categories of error in detail.
Q3 Define the Gaussian curve and probable error.
Q4 State the number of significant figure in each of the following numbers:
(a) 302 (b) 302.10V (c) 0.00030 Ω (d) 0.000030MΩ (e) $5.01 \times 10^{4.}$

Q5 what is limiting error explain with an example?
Q6 a wattmeter having a range 1000W has an error of1% of full scale deflection. If the true power is 100W, what would be the range of readings? Suppose the error is specified as percentage of true value, what would be the range of the readings?
Q7 what is the combination of quantities with limiting errors? Why it is important?
Q8 current was measured during a test as 30.4A, flowing in a resistor of 0.105Ω.it was discovered later that the ammeter reading was low by 1.2 % and the marked resistance was high by 0.3%. Find the true power as a percentage of the power that was originally calculated.
Q9 Give the definition of following terms-
(a) average deviation
(b) standard deviation
(c) variance

Q10 what is random error and how can we limit it?

## UNIT-2

Q1 Explain the working of Electronic Multimeter with diagram.
Q2 Write a short note on:-
(i)Grounding (ii) Shielding
Q3 Explain vector impedance meter.
Q4 what is the difference between voltmeter, ammeter and ohmmeter. Explain the dc voltmeter.
Q5 Explain the digital frequency meter using block diagram.

Q6 Explain the working of Watt Hour meter.

Q7 what is DVM? Explain Ramp type DVM.

Q8 what are the applications of Q-meter?

Q9 write short note on
(a) ballistic galvanometer
(b) vibration galvanometer

Q10 what is electrodynamometer? Explain its working with proper diagram.

## UNIT-3

Q1 Describe the operation of Kelvin's double Bridge and proof unknown resistance is equal to $R_1R_3 / R_2$.
Q2 Measure the frequency using wein's bridge.
Q3 Measure the inductance of range Q>10 using suitable bridge.
Q4 Drive the unknown value using Wheatstone bridge.
Q5 when we use Hay's bridge?
Q6 by which bridge we can measure the precision of capacitors?
Q7 write short note on following-
(a) Wagner's earth connection
(b) sources and detectors

Q8 which bridge is used to measure mutual inductance, explain it.
Q9 describe the simplest method of comparing two capacitances.
Q10 in which manner Kelvin double bridge is better than Kelvin Bridge?

## UNIT-4

Q1 what is transducer? Give classification of transducer using suitable example.
Q2 Explain the working, application, advantages and disadvantages of thermocouple.

Q3 Find the Gauge factor for strain gauge.

Q4 Explain working of Ultrasonic flow meter and load cell.

Q5 what is the selection criteria of transducers?

Q6 write short note on any two from following-
(a) RTD
(b) Thermocouple
(c) Thermistors

Q7 explain the working of LVDT.

Q8 what is the difference between LVDT and RVDT?

Q9 write short note on-

(a) bourdon tube

(b) diaphragm

Q10 explain the working of Ultrasonic flow meter.

## UNIT-5

Q1 Explain the working of cathode ray tube.

Q2 Explain dual beam oscilloscope.

Q3 Explain both types of frequency synthesized signal generator.

Q4 what is the need of electron gun in CRT,explain with example?

Q5 what are the methods of focusing the electron beam?

Q6 draw and explain the CRO.

Q7 how can we measure the phase and frequency in CRO?

Q8 explain frequency selective wave analyzer using suitable block diagram.

Q9 write short note on any two from following below-

(a) heterodyne harmonic analyzer

(b) spectrum analyzer

Q10 explain the working of sweep frequency generator.

# Question Bank for B.Tech. III Sem. End-Term Examination, 2014

# Subject: Linear Integrated Circuits (EC306)

## UNIT – 1

**Q.1** (a) With the help of suitable block diagram, explain the basic building blocks of operational amplifier.
(b) For 741C op-amp which is connected in non inverting configuration have the following , R1=1K and $R_F$ = 10K , A=200000 , $R_i$ =2M ohm , $R_o$ = 75 ohm , $f_o$=5Hz ,Output voltage swing= 13 volts. Compute the values of $A_F$, Rif, $R_{of}$ ,$f_F$ ,$V_{ooT}$.

**Q.2** Draw and explain the circuit diagram of dual input Balanced output differential amplifier and perform its a.c analysis.

**Q.3** Derive the closed loop voltage gain and Input resistance with feedback for voltage series feedback configuration of op-amp.

**Q.4** Draw and explain the pin diagram of Op-amp 741. Also explain the inverting and non-inverting configuration of op-amp.

**Q.5** Explain the following terms

- Input offset voltage
- Input offset current
- Input bias current
- CMRR
- SVRR
- Slew Rate

**Q.6** (a) What is thermal drift? How does it affect the performance of an op-amp circuit?
(b) Assume that an op-amp has $I_{B1}$= 400nA and $I_{B2}$ = 300nA. Determine the input bias current and offset current.

**Q.7** Derive the expression for the gain of the inverting and non-inverting configuration of the operational amplifier using appropriate circuit diagram.

**Q.8** (a) What is differential amplifier? For dual input balanced output differential amplifier configurations perform the d.c analysis.
(b)The bias currents for the emitter coupled transistors of a differential amplifier are 18μA and 22 μA .Calculate the input bias current and input offset current for an op-amp.

**Q.9** (a) What are the characteristics of the ideal op-amp?

(b) For a non-inverting amplifier $R_1$=1KΩ and $R_f$=10KΩ. Determine the closed loop voltage gain of the amplifier and the feedback factor β.

**Q.10** Derive the expression for output resistance and bandwidth with feedback for voltage series feedback configuration of op-amp. Also calculate the same for the voltage follower.

**UNIT-2**

**Q.1** Explain the voltage to current converter with grounded load with the help of circuit diagram.

**Q.2** Explain the summing and averaging and scaling amplifier in inverting and non-inverting configuration using neat circuit diagram.

**Q.3** With the help of circuit diagram explain the current to voltage converter.

**Q.4** Explain the voltage to current converter with floating load.

**Q.5** Explain the subtractor and summing amplifier using a basic differential op-amp configuration.

**Q.6** Explain the peaking amplifier using neat circuit diagram. Also draw the frequency response curve for it and write the expression for peak frequency and bandwidth of it.

**Q.7** Explain the working of a non-inverting summer with neat and clean circuit diagram.

**Q.8 (a)**Explain the working of op-amp non-inverting amplifier. Derive the expression for its voltage gain.
(b)Compare inverting and non-inverting amplifier.

**Q.9** Sketch the circuit of summing amplifier using op-amp to get

$$V_{out} = -V_1 + 2V_2 - 3V_3$$

**Q.10 (a)** An op-amp has feedback resistor $R_F$ =12kΩ and the resistance on the input sides are $R_1$ = 12kΩ, $R_2$ =2kΩ and $R_3$ =3kΩ. The corresponding inputs are $V_1$ = +9V, $V_2$ = -3V and $V_3$ = -1V.Non inverting terminal is grounded. Determine the output voltage.
(b)What is transconductance amplifier? Give some examples.

**UNIT-3**

**Q.1** Explain the first order high pass butterworth filter with the help of circuit diagram and give its complete analysis and draw its frequency response.

**Q.2 (a)** Draw the circuit and frequency response of Band reject filter. Differentiate between narrow band pass and wide band pass filters.

**(b)** Draw the circuit diagram for band pass filter

**Q.3 (**a) Explain the Quadrature wave oscillator with the help of circuit diagram and write the expression for frequency.

(b) Calculate the value of Q factor for band pass filter with $f_L$=200Hz and $f_H$ =1KHz.Verify that this filter is wide band pass filter.

**Q.4** Explain the characteristics and design of second order High pass Butterworth filter using appropriate circuit diagram.

**Q.5** With the help of circuit diagram, give the complete analysis of first order low pass butterworth filter. Also draw the frequency response.

**Q.6** Write short note on-
(a) Zero crossing detector
(b) Sample and hold circuit

**Q.7** With the help of circuit diagram explain the voltage to frequency converter.

**Q.8** Explain the Square wave oscillator using neat circuit diagram. Also draw the output waveforms.

**Q.9** Explain the block diagram and pin diagram of the voltage controlled oscillator (NE/SE 566) and draw the output waveforms.

**Q.10** What is difference between the sawtooth wave and triangular wave? Explain the sawtooth wave generator using circuit diagram and draw the output waveforms.

**UNIT-4**

**Q.1** Draw the block diagram of PLL and explain the function of each block.

**Q.2 (a)** Explain briefly the lock range and capture range of a phase locked loop.
**(b)** Explain PLL as AM detector.

**Q.3** Explain the LM565 PLL using pin configuration and internal connection diagram.

**Q.4** Write short note on-
**(a)** PLL as FSK demodulator
**(b)** Frequency Translator

**Q.5** How a PLL can be used as a frequency synthesizer. Explain it using suitable block diagram.

**Q.6 (a)**Derive the expression for the lock range in a PLL.
**(b)** In a circuit of monostable multivibrator using IC-555, $R_A$=8KΩ and C=0.1μF .Find the period of the output waveform.

**Q.7 (a)** Draw the pin diagram of IC-555 and discuss the function of each pin.
**(b)** Using IC-555 as astable multivibrator with following particulars, $R_A$=$R_B$=8KΩ, C=0.1 μF, $V_{CC}$=5 Volts. Find the frequency of output.

**Q.8** Explain the working of astable multivibrator using IC-555. Draw the neat circuit diagram and the output waveforms. Also give some applications of this multivibrator**.**

**Q.9 (a)** Explain the 555 timer as monostable multivibrator with proper circuit diagram and the waveforms.
**(b)** A IC-555 timer is used as a monostable multivibrator has R=20KΩ and C= 0.01μF. What is the duration of the output pulse?

**Q.10** Write short note on-
- PLL as tracking filter
- Digital PLL
- PLL as signal synchronizer

**UNIT-5**

**Q.1** Explain the four Quadrant multiplier and its applications using suitable circuit diagram.

**Q.2** Describe the operation of the regulated power supply. Give the standard representation of IC voltage regulator.

**Q.3** Explain the fixed and adjustable voltage regulated with their respective series and pin diagram.

**Q.4** Write short notes on:
- Three terminal voltage regulators
- Positive voltage regulator

- Negative voltage regulator

**Q.5** Explain the multiplier as-
(i) Frequency Doubler
(ii) Voltage squarer
(iii) Phase angle detector

**Q.6** Explain how voltage regulation can be achieved using Op-Amp. Draw circuit diagram of a three-terminal voltage regulator with adjustable output. How is voltage regulation measured?

**Q.7** What are the various types of IC regulators? Explain the operation of any IC voltage regulator.

**Q.8** Discuss how three terminal voltage regulator IC can be employed to realize an adjustable voltage output.

**Q.9** Explain major function blocks of the switching regulators. Explain how the output voltage of switching regulator is a function of duty cycle and the input voltage.

**Q.10** What is four quadrant multiplier circuits. Prove that the output voltage $V_0$ is proportional to the linear product of the two input voltages.

# Question Bank for B.Tech. IV Sem. End-Term Examination, 2014
# Subject: Analog Communication (EC 403)

## UNIT-I:

Q1. (a) Define Noise figure and explain its significance, with derivation.

(b) Two port devices are connected in cascade. For the first stage the noise figure and available power gain are 5 dB and 12 dB respectively. For the second stage the noise figure and power gain are 15 dB and 10 dB. Determine overall noise figure in dB. Also find equivalent noise temperature.

Q2. (a) What is noise and which sources of noise in communication.

(b) How many type of noise occurs in communication channel, explain each noise.

Q3. (a) What is thermal noise and design equivalent circuit for thermal noise?

(b) A 600 Ω resistor is connected across the 600 Ω antenna input of a radio receiver. The bandwidth of the radio receiver is 20 kHz and the resistor is at room temperature of 27C. Calculate the noise power and the noise voltage applied at the input of receiver.

Q4. (a) Calculate the Thermal noise for Series and parallel resistor.

(b) An amplifier operating over a frequency range from 17 to 19 MHz has a input resistance of 5 k Ω. What is the rms thermal noise voltage at the input of this amplifier? Assuming operating temperature to be 27C.

Q5. (a) What is White Gaussian noise, and Why it is called Gaussian?

(b) What is noise Bandwidth.

Q6. (a) Calculate noise due to amplifier in cascade.

(b) Two amplifiers are connected in cascade. The first amplifier has a voltage gain of 10, input resistance of 600 Ω. Equivalent noise resistance of 1500 Ω and output resistance of 25 KΩ . These value for second amplifier are 20,80 KΩ, 10KΩ and 2 MΩ respectively. Determine the equivalent noise resistance of the wo stage amplifier.

Q7. (a) What is signal to Noise ratio.

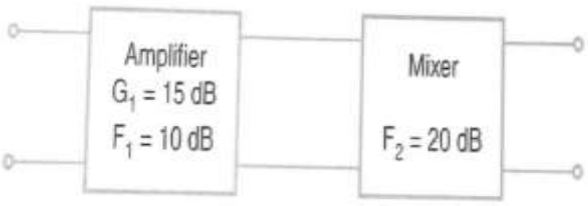
(b) Calculate the signal to noise ratio of an amplifier.

Q8. (a) What is Noise temperature? Calculate Equivalent noise temperature atamplifier input.

(b) An amplifier has a noise figure of 3 dB. Calculate its equivalent noise temperature.

Q9. (a) Calculate noise factor for an amplifier in cascade by using Friiss formula.

(b) In a radio receiver an RF amplifier and a mixer connected in cascade as shown in figure. The amplifier has a noise figure of 10dB and the power gain of 15Db. The noise figure of mixer stage is 20 dB. Calculate the overall noise figure referred to the input.




Q10. Write short note on any three

(i) Shot noise

(ii) Thermal noise

(iii) Partition noise

## UNIT 2:

Q1. (a) What is modulation? What is the need of modulation?

(b) Define the signal and also describe the different type of signal in communications with diagram.

Q2. (a) What is transmission efficiency of Amplitude modulated signal? Derive expression of power content of multiple amplitude modulations.

(b) An AM transmitter radiates 9K watts of power when the carrier is unmodulated and 10.125K watts when the carrier is sinusoidally modulated. Find the modulation index and percentage of modulation.

Q3. (a) What is amplitude modulation? Design mathematical expression and Waveform for Amplitude modulation.

(b) Define modulation index.

(c) The carrier amplitude of AM wave varies between 4 volts and 1 volt. Calculate modulation index.

Q4. (a) Derive total power for a single tone amplitude modulated signal.

(b) For a modulation coefficient of m=0.2 and a unmodulated carrier power $P_c$=1000W, determine

(i) Total side band power

(ii) Upper side band power

(iii) Modulated carrier power

(iv) Total transmitted power

Q5. (a) Explain the operation of Square law modulator with expression and sketches.

(b) Find the modulation efficiency for a modulation factor of 0.5.

Q6. (a) How is double sideband suppressed carrier (DSB-SC) demodulated?

(b) With the help of a suitable sketch, explain the phase shift method for generation of SSB signals.

Q7. (a) Evaluate the effect of a frequency error $\Delta f$ in the local carrier frequency of the detector measured with respect to carrier frequency of the incoming DSB-SC signal in coherent detection.

(b) Discuss and analysis the Diode detector for AM receiver.

Q8. (a) Explain any non coherent AM detector, and how can it differ from coherent detector.

(b) An amplitude modulated signal is given by

$X_{AM}(t)=10\cos(2\pi 10^6 t)+5\cos(2\pi 10^6 t)\cos(2\pi 10^3 t)+ 2\cos(2\pi 10^6 t)\cos(4\pi 10^3 t)$

Find the various frequency components present and corresponding modulation indices.

Q9. (a) Describe the generation of DSB-SC wave using ring modulator.

(b) A carrier wave of 10 MHz i.e. amplitude modulated to 50% level with a tone of 5KHz. Sketch the wave form and amplitude distribution in time and frequency domain. Assuming carrier amplitude of 10V.

Q10. (a) Explain how an AM signal can be generated using Non-linear Modulation, and derive the necessary equations.

(b) Explain the synchronous demodulation of an AM-SSB-SC signal.

## UNIT 3:

Q.1 (a) why we use Pre-emphasis and De-emphasis in FM broadcasting?

(b) Discuss briefly Similarity and difference between AM and FM.

Q2 (a) Explain how a varactor Diode is used to generate FM signal. Explain with the necessary mathematical equations.

(b) What are limitations of direct method of FM generation?

Q3 (a) Explain the Angle modulation. Derive the mathematical relation for FM and PM, also draw the waveforms.

(b) Define the term percentage modulation and determine the percentage modulation for an FM wave with a frequency deviation of 10 kHz if the maximum deviation allowed is 25 kHz.

Q4. (a) What are difference between NBFM and WBFM ? How are they generated?

(b) What is Band width for WBFM according Carson's rule. Calculate the bandwidth requirement for transmits a baseband signal with a frequency range from 300Hz to 3 kHz. For

(i) NBFM with maximum deviation of 5 kHz.

(ii) WBFM with maximum deviation of 75 kHz.

Q5. (a) Explain the Armstrong system for the generation of a FM signal.

(b) An angle modulated signal is described by

$X_c(t)=10\cos[2\pi(10^6)t + \sin\pi t]$ , $X_c(t)$ is PM signal with $k_p=10$ then find m(t). What is signal be FM with $k_f=10$.

Q6. (a) Explain the working of phase locked loop in carrier synchronization, giving its block diagram.

(b) Consider an angle modulated signal:

$X_c(t)=10\cos[(10^8)\pi t +5\sin(10^3)\pi t]$

Find the maximum phase deviation and maximum frequency deviation.

Q7. (a) Explain the principle of operation of frequency discrimination with the aid of a diagram. Explain its use in practical situation.

(b) 10 MHz carrier is frequency modulate by a sinusoidal signal of 5 KHz so that the maximum frequency division is 1 MHz . Estimate the bandwidth of FM carrier.

Q8. (a) Explain the working principle of Foster seeley discrimination method for FM demodulation.

(b) Compare FM and PM.

Q9. (a) Explain the Ration detector for FM demodulation with neat and clean diagram.

(b) Zero crossing detector is use for FM demodulator. If yes, then explain it.

Q10. (a) Explain the basic method of obtaining FM from PM. Also draw waveform for FM and PM.

(b) Explain the Reactance modulator method for FM wave generate.

Q11. (a) Define the following terms for FM wave

(i) Carrier swing

(ii) Frequency deviation

(iii) Percent modulation

(b) A single tone FM signal is given by

$V(t) = 10 \sin (16\pi \times 10^6 t + 20\sin 2\pi \times 10^3 t)$ Volts

Determine followings

(i) Modulation Index
(ii) Modulation frequency
(iii) Frequency deviation
(iv) Carrier frequency

## UNIT 4:

Q1. Show that the figure of merit for the SSB receiver is exactly the same that for the DSB-SC receiver.

Q2. Calculate the signal to noise (S/N) ratio for a double side band (DSB) with carrier signal, obtain its figure of merit.

Q3 Calculate signal to noise(S/N) ratio for and SSB-SC.

Q4. Describe SNR in the communication system; show that baseband, DSB-SC and SSB-SC have same output SNR for a given transmitted power and transmission bandwidth.

Q5. Derive the output signal to noise ratio expression for AM system using a square law detector. Assume the channel noise AWGN with power spectral density $\eta/2$.

Q6. Compare the noise performance in phase modulation and frequency modulation.

Q7. Derive an expression for SNR of a FM demodulator.

Q8. Prove that the output SNR in FM system could be related to Am system by following expression-

$$\left(\frac{S0}{N0}\right)_{FM} = 3B^2 \left(\frac{S0}{N0}\right)_{AM}$$

Q9. Draw the block diagram of Superhetrodyne receiver and explain the function of each stage.

Q.10 Calculate the signal to noise (S/N) ratio in Frequency Modulation.

## UNIT 5:

Q1. Define the sampling theorem. Explain the following samplings:

(a) Natural Sampling

(b) Flat top sampling

Q2. Write short notes on followings (any two)

(a) PAM

(b) PWM

(c) PPM

Q3. (a) Explain various Analog Pulse modulations with suitable diagrams.
(b) Explain the features of pulse width modulation.

Q4. What is Nyquist rate and how we get original signal from sampled signals.

Q5. (a) What is under sampling (aliasing), how can it avoid.
(b) A continuous time signal is give below:
$x(t)=8\cos 200\pi t$
Determine minimum sampling rate i.e, Nyquist rate to avoid aliasing.

Q6. (a) Compare all three sampling technique on performance basic.
(b) An analog signal is expressed by the equation
$x(t)=3\cos(50\pi t) + 10\sin(300\pi t) - \cos(100\pi t)$
Calculate the Nyquist rate for this signal.

Q7. (a) Calculate bandwidth requirement for pulse amplitude modulation.
(b) How PAM signal is demodulated.

Q8. (a) How a Pulse width modulation signal is generate.
(b) Write advantage and disadvantage of PWM over other pulse modulation.

Q9. (a) How a Pulse position modulation signal is generate.
(b) Write advantage and disadvantage of PPM over other pulse modulation.

Q10. (a) Compare PAM, PPM, and PWM.
(b) Explain the PAM-TDM

# Question Bank for B.Tech. IV Sem. End-Term Examination, 2014

## Subject: Signals & Systems (EC404/EE604)

Q.1 Explain the following properties of signals with example:
(a)Time shifting (b) Time reversal (c) Time scaling (d) Amplitude scaling
Q.2 Examine whether the following signals are periodic or not ? If periodic determine the fundamental period.

(a) Sin $12\pi t$ (b) $e^{j4\pi t}$ (c) $x(t) = \cos 2t + \sin \sqrt{3}t$ (d) $x(t) = \sin(10t+1) - 2\cos(5t-2)$

(e) $x(t) = \sin 10\pi t + \cos 20\pi t$

Q.3 Explain the following signals using mathematical expressions and graphical representations--
(a)Unit step (b) Unit impulse (c) Unit ramp (d) Signum (e) Sinc
Q.4 Check whether the following systems are causal or not-
(a) $y(t) = x^2(t) + x(t-4)$
(b) $y(t) = x(2-t) + x(t-4)$
(c) $y(t) = x(2n)$
(d) $y(t) = x\left(\frac{t}{2}\right)$
Q.5 Explain the following signals with example
(a)Deterministic and Random Signals
(b) Periodic and Non-Periodic Signals
(c) Causal and Non-Causal Signals
(d) Even and Odd Signals
Q.6 Check whether the following systems are linear or not-
(a) $\frac{d^2y(t)}{dt^2} + 2ty(t) = t^2 x(t)$
(b) $\frac{dy(t)}{dt} + y(t) = x(t)\frac{dx(t)}{dt}$
(c) $y(t) = x(t^2)$
(d) $y(t) = 2x^2(t)$

Q.7 Explain the following systems with example-
(a)Static and Dynamic systems
(b) Linear and Non-linear systems
(c) Time variant and time invariant systems
(d)Causal and Non-Causal system

Q.8 (a) Discuss the following systems

(i)Continuous time LTI system

(ii)Discrete time LTI System

(b)Determine whether each of the following sequences is periodic or not. If periodic, determine the fundamental period-

(i) $x(n) = \sin\left(\frac{6\pi n}{7}\right)$

(ii) $x(n) = \sin\left(\frac{n}{8}\right)$

Q.9 (a) What do you mean by differential and difference equations? Explain with example.

(b) Prove that the system described by the differential equation

$\frac{d^2y(t)}{dt^2} + y(t)\frac{dy(t)}{dt} + y(t) = x(t)$ is a non-linear system.

Q.10 Check the following systems for linearity

(a) y(t)= 5sin x(t)

(b) y(t) =x(sin(t))

(c) y(n)=2x(n)-3

(d) $y(t)=x^2(t)$

(e) $\frac{dy(t)}{dt} + 2y(t) = x^2(t)$

## UNIT-2

Q.1 Derive the expression for the trigonometric Fourier series coefficients.

Q.2 (a) Discuss the linearity and shifting property of CTFT with example.

(b)Find the CTFT of $S(t)\cos w_0 t$ by using frequency shifting property of CTFT.

Q.3 Using properties of fourier transform, find the fourier transform of the following-

**(a)** $e^{-at}u(t)$ **(b)** $te^{-2t}u(t)$ **(c)** $e^{-3t}u(t-2)$ **(d)** $\partial(t+2)+\partial(t+1)+\partial(t-1)+\partial(t-2)$

**(e)** $\sin\omega_0 t\ u(t)$

Q.4 Explain the following properties of CTFT with example-

(a)Time scaling property

(b)Differentiation in time domain property

(c)Convolution property

(d) Multiplication property

Q.5 (a) Find the fourier transform of the signal

$$x(t)=\begin{cases}1-t^2 & 0<t<1\\ 0 & otherwise\end{cases}$$

**(b)** Use the appropriate fourier transform properties to find the Fourier transform of

$g(t)=te^{-|t|}$.

Q.6 Using partial fraction expansion, find the inverse fourier transform of the following-

(a) $X(\omega)=\dfrac{4(j\omega)+6}{(j\omega)^2+6(j\omega)+8}$

(b) $X(\omega)=\dfrac{1+3(j\omega)}{(j\omega+3)^2}$

Q .7 (a) Using fourier transform find the convolution of the signals

$x_1(t)=e^{-2t}u(t)$ and $x_2(t)=e^{-3t}u(t)$

(b)A causal and stable LTI system has the frequency response $H(\omega)=\dfrac{4+j\omega}{6-\omega^2+5j\omega}$.

Determine a differential equation relating the input $x(t)$ and output $y(t)$.

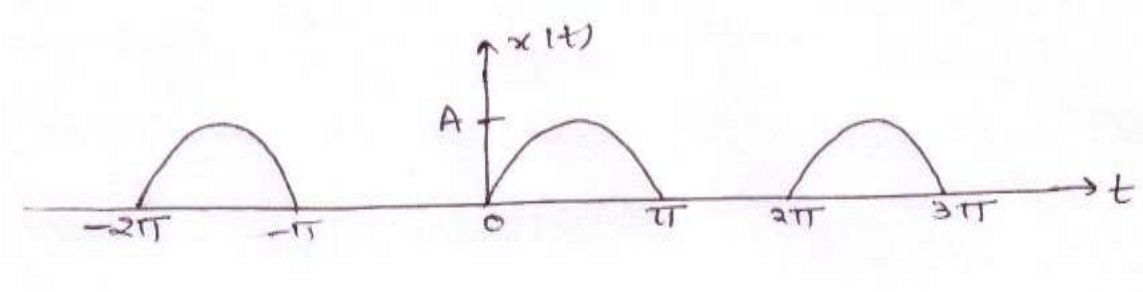
Q.8 The input and output of a causal LTI system are related by the differential equation

$$\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=x(t)$$

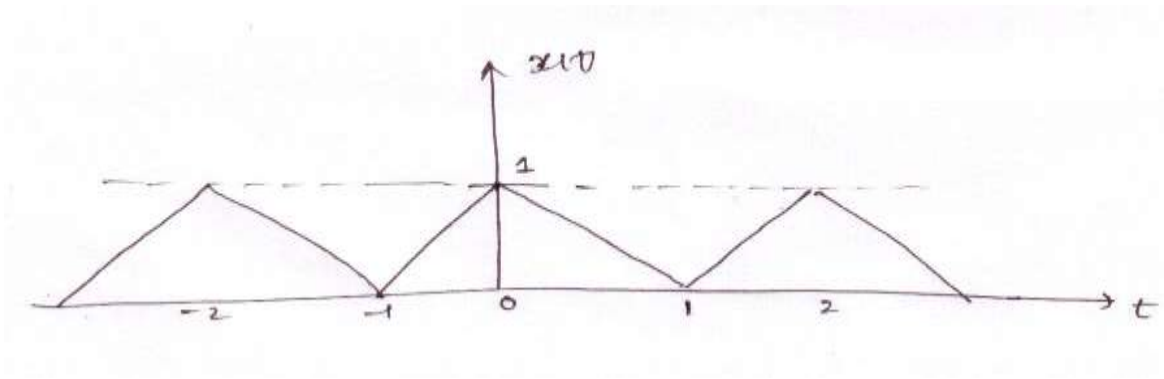
(a) Find the impulse response of the system.

(b) What is the response of this system if $x(t)=te^{-4t}u(t)$

Q.9 Find the trigonometric Fourier series of the given half wave rectified sine wave and sketch the line spectrum:




Q.10 Find the trigonometric fourier series for the triangular wave and plot the line spectrum.




**UNIT-3**

Q.1 (a) Explain the time shifting and frequency shifting properties of DTFT.

(b)Find the fourier transform of the given signal

$$x(t)=\begin{cases}2 & for -4<t<-2\\ 2 & for 2<t<4\\ 0 & elsewhere\end{cases}$$

Q.2(a) Find the convolution of the two signals given below using fourier transform:

$$x_1(n)=\left(\frac{1}{2}\right)^n u(n)$$

$$x_2(n)=\left(\frac{1}{3}\right)^n u(n)$$

(b) Find the inverse fourier transform of $X(\omega)=\frac{j\omega}{(2+j\omega)^2}$.

Q.3 Find the DTFT of the following sequences:

(a) $\delta(n-m)$

(b) $\delta(n+3)-\delta(n-3)$

(c) $-a^n u(-n-1)$

(d) $x(n)=u(n+3)-u(n-3)$

(e) $x(n)=\begin{cases}n & -4\le n\le 4\\ 0 & otherwise\end{cases}$

Q.4 Explain the following properties of DTFT with example-

(a)Linearity

(b)Time shifting

(c) Frequency shifting

(d)Convolution Property

Q.5 Find the DTFT of the following sequences;

(a) $\delta(n+3)-\delta(n-3)$

(b) u(n+3)-u(n-3)

(c) $-a^{n}u(-\mathrm{n}-1)$

(d) $x(\mathrm{n})=\left(\frac{1}{2}\right)^{n-2}u(\mathrm{n}-2)$

(e) $x(\mathrm{n})=\cos\left(\omega_{o}n\right)u(\mathrm{n})$

Q.6 Using properties of DTFT, find the DTFT of the following-

(a) $\left(\frac{1}{3}\right)^{n-3}u(\mathrm{n}-3)$

(b) $n2^{n}u(\mathrm{n})$

(c) $e^{3n}u(\mathrm{n})$

d) u(n+1)-u(n+2)

Q.7 Find the frequency response of the following causal systems:

(a) $y(\mathrm{n})-\mathrm{y}(\mathrm{n}-1)+\frac{3}{16}y(\mathrm{n}-2)=x(\mathrm{n})-\frac{1}{2}x(\mathrm{n}-1)$

(b) $y(\mathrm{n})-\frac{1}{4}\mathrm{y}(\mathrm{n}-1)-\frac{3}{8}y(\mathrm{n}-2)=x(\mathrm{n})+x(\mathrm{n}-1)$

Q.8 The output y(n) for a linear shift variant system with input x(n) is given by
$y(\mathrm{n})=x(\mathrm{n})-2x(\mathrm{n}-1)+x(\mathrm{n}-2)$
Determine the magnitude and phase response of the system.

Q.9 Consider a discrete time LTI system with unit sample response:

$$h(\mathrm{n})=\left(\frac{1}{2}\right)^{n}u(\mathrm{n})+\frac{1}{2}\left(\frac{1}{4}\right)^{n}u(\mathrm{n})$$

Determine a linear constant coefficient difference equation relating the input and output of the system.

Q.9 A causal system is described by the difference equation
$y(\mathrm{n})-\mathrm{ay}(\mathrm{n}-1)=bx(\mathrm{n})+x(\mathrm{n}-1)$ where a is real and less than 1 in magnitude. Find a value of b such that the frequency response of the system satisfies

$$\left|H\left(e^{j\omega}\right)\right|=1,\quad \text{for all } \omega$$

Q.10 (a) Determine the inverse DTFT of

$$X(\mathrm{e}^{j\omega})=\frac{1}{\left(1-ae^{-j\omega}\right)^{2}}\quad ,\ |a|<1$$

(b) Determine the fourier transform of the sequence

$$y(\mathrm{n})=\mathrm{na}^{n}u(\mathrm{n}),\qquad |a|<1$$

**UNIT-4**

Q.1 (a) Explain the linearity and time reversal property of Z-transform.

(b)Find the z-transform and the ROC of the signal

$$x(\mathrm{n}) = \left[3(2^n) - 4(3^n)\right] u(\mathrm{n})$$

Q.2 (a) Explain the initial and final value theorems of z-transform.

(b)Find the z-transform and ROC of the following sequence

$$x(\mathrm{n}) = \left(-\frac{1}{3}\right)^n u(\mathrm{n}) - \left(\frac{1}{2}\right)^n u(-\mathrm{n}-1)$$

Q.3 (a) Find the difference equation satisfying the input and output of an LTI system with transfer function:

$$H(\mathrm{z}) = \frac{(1+\mathrm{z}^{-1})^2}{(1-\frac{1}{2}\mathrm{z}^{-1})(1+\frac{3}{4}\mathrm{z}^{-1})}$$

(b)Using properties of z-transform, Find the z-transform of the given signal

$$x(\mathrm{n}) = \mathrm{n}a^n u(\mathrm{n})$$

Q.4 A causal discrete time LTI system is described by

$y(\mathrm{n}) - \frac{3}{4} y(\mathrm{n}-1) + \frac{1}{8} y(\mathrm{n}-2) = x(\mathrm{n})$ , where $x(\mathrm{n})$ and y(n) are the input and output of the system respectively.

(a) Determine the system function H(z).
(b) Find the impulse response h(n) of the system.

Q.5 (a) Find the z-transform and ROC of the given discrete time signal:

$x(\mathrm{n}) = \left(\frac{1}{2}\right)^n u(\mathrm{n}-2)$ . Sketch the Pole zero location and ROC.

(b)Find the z-transform and the ROC of the following signal:

$$x(\mathrm{n}) = n\left(\frac{1}{2}\right)^n u(\mathrm{n}) * \left[\partial(\mathrm{n}) - \frac{1}{2}\partial(\mathrm{n}-1)\right]$$

Q.6 (a) Define laplace transform. Explain the time shifting and differentiation in time domain property of laplace transform with example.

(b) Find the laplace transform and ROC of the left-sided signal $x(\mathrm{t}) = \left[e^{3t} + 5e^{2t}\right]u(-\mathrm{t})$ .

Q.7 (a) What do you mean by region of convergence for Laplace transform? Also discuss various properties of ROCs for Laplace transform.

(b)Consider an LTI system whose response to the input $x(t) = \left[ 2e^{-t} - e^{-3t} \right] u(t)$ is $y(t) = \left[ 3e^{-2t} - 3e^{-4t} \right] u(t)$. Find the system's impulse response.

Q.8 (a) Give the statement for the following theorems for Laplace transform

(i)Initial value theorem

(ii)Final value theorem

(c) An LTI system has a unit step response given by $s(t) = (1 - e^{-t} - te^{-t})u(t)$. For a certain input $x(t)$,the output is observed to be equal to $y(t) = (2 - 3e^{t} + e^{-3t})u(t)$.What is $x(t)$?

Q.9 A continuous time LTI system is initially relaxed and is represented by the equation

$$\frac{d^2 y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2x(t)$$

(i) Determine the transfer function of the system

(ii)Determine the impulse response of the system

(iii)Find response of the system to an input $x(t) = 4e^{-3t} u(t)$

Q.10 A system described by the differential equation

$$\frac{d^2 y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t) \quad ;$$

$\frac{dy(0)}{dt} = 3$, $y(0) = 1$, $x(t) = u(t)$ . Find the transfer function and the output signal $y(t)$ .

UNIT-5

Q.1 (a) State and prove the sampling theorem in time domain. Explain about nyquist rate.
(b) Given the signal $3\cos(2000\pi t)+5\sin(6000\pi t)+10\cos(1200\pi t)$ .What is the Nyquist rate for this signal.

Q.2 (a) Define following terms:

(i) Under Sampling (ii) Critical Sampling

(iii) Over Sampling

(b) Find the Nyquist rate and Nyquist interval for the continuous time signal

$$s(t) = \frac{1}{2\pi}\, Cos\,(4000\,\pi\, t)\, Cos\,(1000\,\pi\, t)$$

Q.3 Determine the Nyquist sampling frequency and Nyquist interval for the following signals
(i) $\sin 200\pi t+\sin 1000\pi t$
(ii) $\sin 1000\pi t \cos 2000\pi t$
(iii)sinc(2000t)
(iv) sinc(2000t) +sinc(3000t)
Q.4 (a) Explain aliasing and how it is reduced.
(b)Given the signal
X(t) = 10cos(2000πt)cos(8000πt)
What is the minimum sampling rate based on the low pass uniform sampling theorem?
Q.5 Write short note on the following:
(i)Nyquist rate and Nyquist Interval
(ii) Linear Interpolation
(iii)Prealias Filter

Q.6 (a) Explain the ideal and flat top sampling in detail.
(b)Consider the continuous time signal
X(t) = 3cos(2000πt) + 5sin(6000πt) +10cos(1200πt). What is the Nyquist rate for this signal?
Q.7 (a) What is aliasing phenomenon? How can aliasing phenomena be eliminated?

(b) Given the continuous time signal
$s(t) = 5\ Cos\ 200\ \pi\ t$

Determine minimum sampling rate i.e. Nyquist rate required to avoid aliasing.

Q.8 (a)How a signal can be reconstructed from its sample using interpolation technique. Explain.
(b)What is the effect of under sampling of a signal? How it can be avoided.
Q.9 A signal x(t) = sin(200πt) is sampled at a rate of (a) 150Hz (b) 225 Hz (c) 300 Hz. For each of these three cases, signal x(t) can be recovered from its sampled signal.
Q.10 Write short note on ;
(i) Sampling in frequency domain
(ii) Sampling of discrete time signals

# Question Bank for B.Tech. VII Sem. End-Term Examination, 2014
# Subject: Industrial Electronics (EC405/EE501)

**UNIT 1**

1. Explain the reverse recovery characteristics of power diode. What do you mean by softness factor and derive the expression of reverse recovery current.
2. Draw the switching characteristics of power transistor. Explain the following terms in reference to it:
   a) Delay time ($t_d$)
   b) Rise Time ($t_r$)
   c) Storage time ($t_s$)
   d) Fall Time ($t_f$)
3. Draw the 3D structure of TRIAC and explain any three modes of operation.
4. Clearly explain the basic structure and working of IGBT with the help of neat diagram.
5. Draw the switching characteristics of SCR during turn-on condition and clearly explain the terms; delay time, rise time and spread time.
6. What do you mean by thyristor commutation techniques? Explain any two of the following techniques:
   a) Class B commutation
   b) Class C commutation
   c) Class D commutation
   Also mention the various relevant waveforms.
7. The specification sheet of an SCR gives maximum rms on-state current as 50A. If this SCR is used in a resistive circuit, compute its average on-state current rating for conduction angle of $30^o$ in each case of (i) half sine wave and (ii) rectangular wave each with supply frequency of 50Hz. Derive each of the expressions used to obtain the answer.
8. Consider the circuit of resonant pulse commutation (Class B commutation). Following are the parameters required:
   C = 20μF, L = 5μH, initial voltage across capacitor is Vs = 230V, constant load current of 300A.
   Calculate:
   a) Conduction time for auxiliary thyristor
   b) Voltage across main thyristor when it gets commutated
   c) Circuit turn-off time for the main thyristor.
9. In reference to class C commutation, Vs = 200V, $R_1$ = 10Ω. Find the value of C so that the SCR gets turned off in 50μs.
   It is required that T2 is turned off naturally when current through it falls belowthe holding current of 4mA. Find the value of $R_2$.
10. Explain all six triggering techniques of SCR clearly.

UNIT 2

1. Explain the concept of phase control in reference to single phase half wave rectifier circuit using R load. Draw the various waveforms and derive the expressions of $V_s$, $I_g$, $V_o$, $I_o$ and $V_T$.
2. Explain the concept of phase control in reference to single phase half wave rectifier circuit using RL load. Draw the various waveforms and derive the expressions of $V_s$, $I_g$, $V_o$, $I_o$ and $V_T$.
3. Explain the concept of single phase full wave mid-point converter. Derive the expression for load voltage for RL load and draw all relevant waveforms.
4. State the principle of single phase full wave bridge converter. Derive the expression for load voltage with RL load and draw all relevant waveforms.
5. What do you mean by semiconverter? Draw the circuit diagram for single phase semiconverter with RLE load rigged with free-wheeling diode.
6. A single phase full converter bridge is connected to RLE load. The source voltage is 230V, 50Hz. The average load current of 10A is continuous over the working range. For R=0.4Ω , L=2mH, compute
   a) Firing angle delay for E = 120V
   b) Firing angle delay for E = -120V
7. A single phase full converter delivers power to a resistive load R. For ac source voltage $V_s$, show that average output voltage $V_0$ is given by

$$V_0 = \frac{\sqrt{2}V_s}{\pi}(1 + cos\alpha)$$

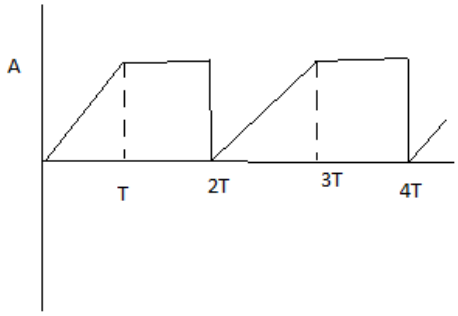
   Show that rms value of output current is given by

$$I_0 = \frac{V_s}{R}\left[\frac{1}{\pi}\left\{(\pi - \alpha) + \frac{1}{2}sin2\alpha\right\}\right]^{\frac{1}{2}}$$

8. A single phase full converter feeds power to RLE load with R = 6Ω, L = 6mH and E = 60V. The source voltage is 230V, 50Hz. For continuous conduction, derive the expression for load current and find its average value for a firing angle delay of $60^o$.
9. Draw the circuit diagram of three phase full converter and clearly explain its working.
10. A single phase full converter charges a battery which offers a constant emf of E. A resistor R is inserted to limit the battery charging current. Derive an expression for the average charging current. Take $V_r$ as the voltage drop in conducting SCRs.

UNIT 3

1. Explain single phase half wave bridge inverter with the help of neat circuit diagram and corresponding waveforms.
2. Explain single phase full wave bridge inverter with the help of neat circuit diagram and corresponding waveforms.
3. Obtain the amplitude spectrum for the following waveform:




4. Explain three phase half wave bridge inverter with the help of neat circuit diagram.
5. Explain the working of three phase 180 degree mode VSI and draw the relevant waveforms.
6. Explain the working of three phase 120 degree mode VSI and draw the relevant waveforms.
7. Clearly explain the working of current source inverters.
8. A single phase CSI is fitted with ideal switches. Describe its working when its load is a capacitor C. Show that frequency of the input voltage to CSI is twice that of the switching of thyristors.
9. A single phase CSI has the following data:
   I = 30A, f = 500Hz, Load capacitance = 30μF
   For this inverter, calculate
   a) The circuit turn-off time.
   b) The peak value of the reverse voltage that appears across the thyristors.
10. Explain the effect of R, L and C component values on load current with help of relevant waveforms.

UNIT 4

1. Tabulate the difference between Class A chopper and Class B chopper with the help circuits, formulas and waveforms.
2. Explain the different control strategies for controlling the chopper output voltage.
3. Explain Type C and Type D chopper circuits with help neat circuit diagram.
4. An RLE load is operating in a chopper circuit from a 500V dc source. For the load, L = 0.06H and R = 0. For the duty cycle of 0.2, find the chopping frequency to limit the amplitude of load current to 10A.
5. Explain, with the help of neat diagram, the working of single phase to single phase mid point step up cycloconverter.
6. Explain, with the help of neat diagram, the working of single phase to single phase step down cycloconverter.
7. Explain, with the help of neat diagram, the working of three phase to single phase cycloconverter. Give example of

$$f_o = \frac{1}{8} f_s$$

8. Explain the principle of three phase to three phase cycloconverter using 18 SCRs with the help of a neat circuit diagram.

9. Derive the output voltage equation for a cycloconverter and explain the steps considered while deriving.
10. Explain the principle of three phase to three phase cycloconverter using 36 SCRs with the help of a neat circuit diagram.

UNIT 5

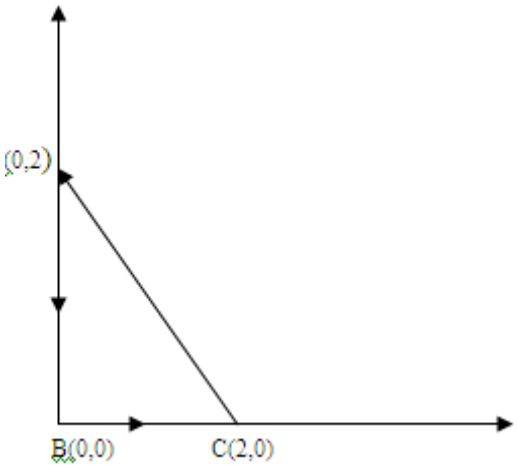
1. What do you mean by electric drives? Explain the purpose of each block of modern electric drive system using power electronic converter.
2. Derive the general expression of speed for separately excited dc motor. Explain its concept with the help of an equivalent circuit.
3. A separately excited dc motor is supplied from 230V, 50Hz source through a single phase half wave controlled converter. Its field is fed through 1-phase semiconverter with zero degree firing angle delay. Motor resistance $r_a = 0.7\Omega$ and motor constant = 0.5V-sec/rad. For rated load torque of 15Nm at 1000rpm and for continuous ripple free currents, determine:
   a) Firing angle delay of the armature converter.
   b) Rms value of thyristor current
   c) Input power factor of the armature converter.
4. Explain with diagram single phase semiconverter drives and drive the expression for input power factor.
5. How chopper drives are more suitable for motoring control. Express your answer in terms of a neat diagram and drive the expression for speed.
6. What are the various methods of speed control of three phase induction motor? Briefly explain each of them (just the principle) and write the expression of load torque (do not derive it).
7. Derive the expression for load torque using stator frequency control in three phase induction motors. Explain the speed – torque characteristics for the same.
8. Show how the speed of three phase induction motor is controlled using stator voltage and frequency control. Briefly explain the speed – characteristics for the same.
9. Explain the speed torque characteristics of a three phase induction motor with variable-voltage and variable-frequency power supply.
10. Derive the expression input power factor for single phase full converter fed dc drive. State the assumptions made.

# Question Bank for B.Tech. V Sem. End-Term Examination, 2014

## Subject: Electromagnetic Field Theory (EC406/EE506)

### UNIT-I

Q1. Verify stokes theorem for the vector function $A = xya_x + 2yza_y + 3zxa_z$ using the triangular shaded area shown in fig




(b) Explain various types of vector field:-

I. Solenoidal & Irrotational field
II. Irrotational but not solenoidal field
III. Solenoidal but not Irrotational field
IV. Neither Irrotational nor Solenoidal Field

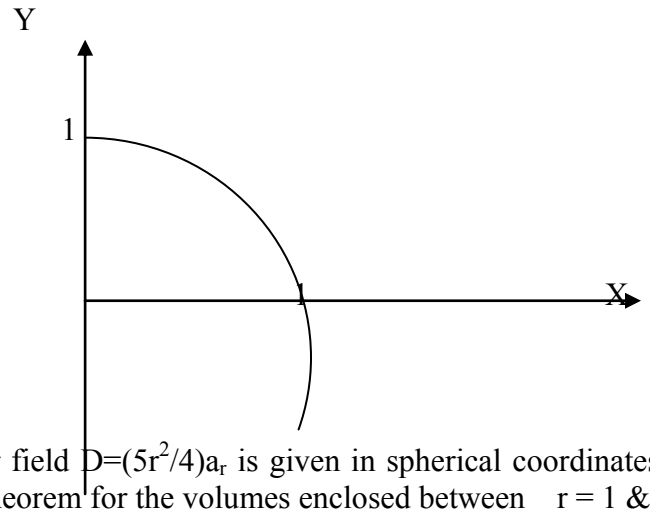
Q2. Show that vector transformation between cylindrical and spherical coordinates is obtained using

$$\begin{bmatrix} A_\rho \\ A_\phi \\ A_z \end{bmatrix} \begin{bmatrix} \text{Cos}\Phi & \text{Sin}\Phi & 0 \\ -\text{Sin}\Phi & \text{Cos}\Phi & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} Ax \\ Ay \\ Az \end{bmatrix}$$

$$\begin{bmatrix} A_r \\ A_\theta \\ A_\phi \end{bmatrix} = \begin{bmatrix} \text{Sin}\theta\ \text{Cos}\Phi & \text{Sin}\theta\text{Sin}\Phi & \text{Cos}\theta \\ \text{Cos}\theta\ \text{Cos}\Phi & \text{Cos}\theta\text{Sin}\Phi & -\text{Sin}\theta \\ -\text{Sin}\Phi & \text{Cos}\Phi & 0 \end{bmatrix} \begin{bmatrix} Ax \\ Ay \\ Az \end{bmatrix}$$

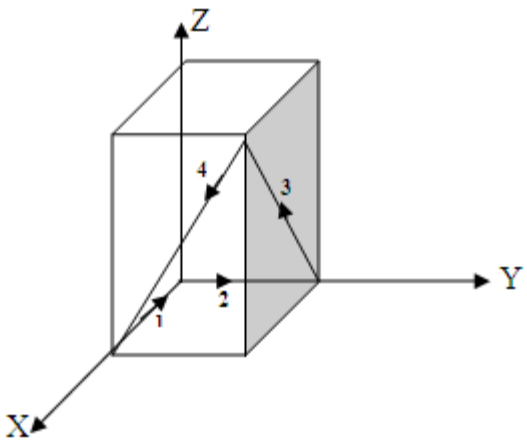
Q3. Discuss how rectangular ,cylindrical & spherical coordinate system can be correlated with one another .

Q4. Given $A = 2r\cos\phi\ a_r + ra_\phi$ in cylindrical coordinates for the contour shown in fig. below .Verify the stokes theorem (Taking path direction anticlockwise)




Q5. A vector field $D=(5r^2/4)a_r$ is given in spherical coordinates .Evaluate both sides of divergence theorem for the volumes enclosed between r = 1 & r = 2 .

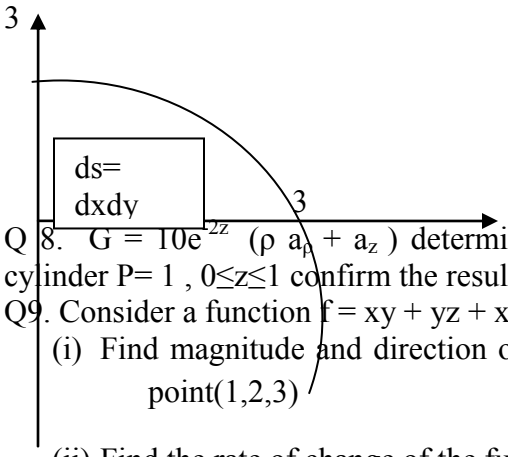
Q6. States & proves Green's theorem. Given that $F = x^2a_x - xza_y - y^2a_z$ , calculate the circulation of F around the closed path as given in fig.




Q7.Given a vector field :

$A = xy\, a_x - 2x a_y$

Verify Stokes theorem over the path shown in the following figure (Taking path direction anticlockwise)




Q 8. $G = 10e^{-2z}(\rho\, a_\rho + a_z)$ determine the flux of G out of the entire surface of the cylinder P= 1 , $0 \le z \le 1$ confirm the result using the divergence theorem.

Q9. Consider a function f = xy + yz + xz

(i) Find magnitude and direction of the maximum rate of change of the function at point(1,2,3)

(ii) Find the rate of change of the function at the same point in the direction of vector

$$A = 2\, a_x + 2a_y + a_z .$$

Q10. Find the divergence, Curl, and gradient of the following vector field:-

$C = (r^2 + \sin\theta\cos\phi)a_r + r\sin\theta\cos\phi a_\theta + (4/7\tan\theta + \sin\phi)$

## UNIT-II

Q1 Derive an expression for E due to charge uniformly distributed over an infinite plane with density $\rho_s$ .

Q2. The Spherical region 0<r<10 cm contains a uniform volume charge density $\rho_v = 4\mu/m^3$ .

(i) Find $Q_{enclosed}$ 0<r<10cm

(ii) Find Dr 0<r<10c

Q3. State & prove the Uniqueness Theorem

Q4.What do you understand by boundary condition? How can we determine boundary condition? Explain considering case of conductor Dielectric Boundary.

Q5.Derive Poisson's & Laplace's equation Two point charges of equal mass m and charge Q are suspended at a common point by two threads of negligible mass and length l. Show that at equilibrium the inclination angle α of each thread to the vertical is given by

$$\mathbf{Q^2 = 16\pi \epsilon_o mgl^2 \sin^2 \alpha \tan \alpha}$$

If α is very small show that

$$\mathbf{\alpha = (Q^2/16\pi \epsilon_o mgl^2)^{3/2}}$$

Q6. Derive the electric field for parallel plates –capacitor which have equal and opposite charge.

Q7. State and explain Gauss's law. A spherical volume charge distribution ρ is given by

$$\rho = \rho_0 (1 - r^2/100) \text{ for } r <= 10\text{mm}$$
$$= 0 \text{ for } r > 10\text{mm}$$

Show that the maximum value of electric field intensity E occurs at r = 7.45 mm .obtain the value of E at r = 7.45 mm.

Q8. Suppose a uniform electric field exists in the room in which you are working, such that the lines of force are horizontal and at right angles to one wall. As you walk toward the wall from the lines of force emerge into the room ,are you walking toward with reason explain it.

Q9. Two extensive homogenous isotropic dielectrics meet on plane z = 0.For $z > 0$ $\epsilon_{r_1} = 4$ and for $z < 0$ ,$\epsilon_{r_2} = 3$. A uniform electric field $E1 = 5a_x - 2ay + 3az$ KV/m exists for z >=0.Find

(a) E2 for z <= 0
(b) The angles E1 and E2 make with interface
(c) The energy densities in both dielectrics
(d) The energy within a cube of side 2 m centered at ( 3, 4,-5)

Q10.How can be solve boundary value problem explain it. Derive the Energy density in electrostatic field and prove that for continuous charge distribution:

$$W_E = 0.5 \int E^2 \epsilon_O$$

## UNIT-III

Q1(a). Explain what you understand by the circuit parameters:-

(i) Self inductance

(ii) Mutual inductance

(b) Write short note on analogy between electrical & magnetic fields

Q2. Explain the vector magnetic potential & scalar magnetic potential.

Q3. Show that magnetic energy density, Wmin case of magnetic field established by a single coil is given as

$$Wm = \tfrac{1}{2} B.H$$

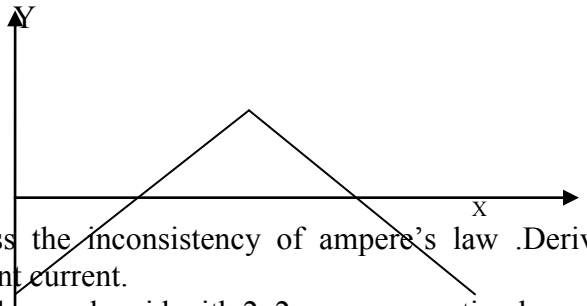
Q4. A solenoid of length l and radius a consist of N turns of wire carrying current I .Show that at point its axis,

$$H = nI/2(\cos_{\theta 2}-\cos_{\theta 1})\, a_z$$

Where n = N/l, and are the angles subtended at P by the end turns as illustrated in figure .Also show that if L>> a,at the centre of the solenoid .

$$H = nIa_z$$

Q5. A conducting triangular loop as shown in figures carries a current of 10A.Find at (0, 0, 5) due to side 1 of the loop.




Q6. Discuss the inconsistency of ampere's law .Derive and the explain the idea of displacement current.

Q7.A very long solenoid with 2x2 cm cross section has an iron core ($\mu r = 1000$) and 4000 turns / meter .If it carries a current of 500mA.Find

Q8. (a) Derive general expression for the boundary condition for static magnetic field for

(i) Tangential component

(ii) Normal Component

(b) Consider an interface in the Y-Plane. The region x<0 is medium –I with $\mu_{r1}$ =4.5 and magnetic field ,H =4 $a_x$ + 3$a_y$ – 6$a_z$ A/m . the region x>0 is medium – 2 with $\mu_{r2}$ = 6 .Determine H2 in medium -2 and angle made by $H_2$ with the normal to the interface .

(c) Using Biot-Savart's Law prove that divergence of B = 0 where B is magnetic flux density vector.

Q9. A current distribution gives rise to the vector potential

$$A = x^2 y\, a_x + y^2 x a_y - 4xyza_z \quad \text{Wb/m}$$

Calculate :

(i) B at (-1,2,5)

(ii) Magentic flux throgh the surface defined by z = 1, $0 \le x \le 1$, $-1 \le 4 \le 4$

Q10. Derive general experssion for the boundary condtion for static magnetic field for

(i) Tangential component

(ii) Norma

## UNIT-IV

Q1. Discuss the inconsistency of ampere's law .Derive and the explain the idea of displacement current. Two regions are separated by a surface 3x-2y+5z=0.Region 1 has permeability $\mu_1 = 2\mu_0$ and region 2 has $\mu_2 = 5\mu_0$. The point Φ(2,2,2) lies in region 2 for a field.

$$H_1=4i+6j-3k \text{ Amp/m}$$

Find the field $H_2$ and $B_2$.

Q2. Define the standing wave ratio, find its maximum and minimum possible value. Electric vector $\vec{E}$ of a wave in free space is given by Ex=Ez=0 and Ey = A cosω(t-Z/c)

Where C = velocity of light .Using Maxwell's equation for free space determine the expression for the component for $\vec{H}$ .

Q3. Define displacement current .Find it in case of a parallel – plate capacitor with plate area of 5 cm2 and the plate separation of 3mmm has a voltage $50\sin 10^3 tV$ applied to its plates.

Q4. Derive general expression for reflection coefficient and transmission coefficient for E & H fields when an electromagnetic waves is incidents normally on the boundary separating two different perfectly dielectric media

Q5. Explain Maxwell's Equation for time varying field, Static field, Harmonic field.

Q6. Discuss the propagation of uniform plane wave in a conductor. Explain the term SkinEffect and Skin depth.

Q7. Discuss the inconsistency of Ampere's Law and explain how the inconsistency was removed by Maxwell.

Q8.Using Maxwell's equation, find the pointing vector for

(i) Static field
(ii) Time varying field

Is there any energy transfer for first case?

Q9. A uniform plane wave in a medium having σ =10-3 s/m ,Є = 80 Є0 and $\mu = \mu_0$ is having a frequency of 10 KHz. Calculate :

i) Loss tangent
ii) Attenuation constant
iii) Phase constant
iv) Intrinsic impedance
v) Skin Depth

vi) Wavelength
vii) Velocity of wave

Q10. A square coil with loop area .01m2 and 50 turns rotated about its axis at right angle to a uniform magnetic field B=1 tesla . Calculate the instantaneous value of e.m.f induced in the coil when its plane is

i) at right angle to the field
ii) in the plane of the field
iii) when the plane of coil is 45degree to the field

## UNIT-V

Q1. Explain the following terms
(i) Retarded potential

(ii) Radiation Resistance

Q2.Write Short note on Radiation from a small Current Element.
Q3. Derive the Expression of Radiation Resistance of a small current element .Calculate the radiation resistance of a $\lambda / 100$ m, $\lambda / 4$ m monopole and dipole antennas
Q4. An Electric Field strength of 10 $\mu$ v/m is to be measured at an observation point $\theta = \pi / 2$ , 500 km from a half wave dipole antenna operating in air at 50 MHz
(i) What is the length of dipole

(ii) Calculate the current that must be fed to the antenna

(iii)Find the average power radiated by the antenna

Q5. Discuss the various EMI coupling modes and different method of eliminating interference.
Q6.Discuss EMI testing with reference to Emission and susceptibility.
Q7. Discuss radtion from a small current element and hence calculate values of radiated power and radiation resistance
Q8. Name the types of transmission lines used in communcation link .State the factors deciding primary constantm of a line.
Q9. Ashort dipole having length 20 cm Irms = 1.5 Amp , f= 1MHz Determine
(i) Radiation resistance

(ii) Power Radiated

(iii)$E\theta$

(iv)At a distance of 1 kilometer ,$E\theta$

Q10.What do you understand by the term elctromagnetic interference and electromagnetic compatibility ? Discuss different methods of eliminating EMI

# Question Bank for B.Tech. V Sem.End-Term Examination2014

# Subject: Microwave Engineering-I (EC-501)

## UNIT 1

Q.1 Describe the features of microwave signals which makes it useful in today's world. Hence explain the applications associated with each feature.

Q.2 Derive an expression for solution of TE mode in rectangular waveguide. Q.3 A rectangular waveguide is filled by dielectric material of $\varepsilon_r$=9, inside the dimension of 7 * 3.5cm.It operates in the dominant $TE_{10}$ mode. Determine (a) cut-off frequency

(b) Phase velocity at a frequency of 2GHz

(c) Guided wavelength $\lambda g$ at the same frequency.

Q.4 Explain the phenomenon of propagation of microwave signals in waveguides. Also explain why transmission is not possible through coaxial cables.

Q.5 Using fundamental waveguide relation derive the condition described as 'waveguide law'.

Q.6 Derive an expression for solution of TM mode in rectangular waveguide.

Q.7 Derive an expression for power transmission and power losses in a waveguide.

Q.8 An air-filled rectangular waveguide with dimension of 3 * 1cm operates in $TE_{10}$ mode at 10GHz.The waveguide is perfectly matched and maximum E field existing everywhere in the guide is $10^3$V/m. Determine the voltage, current and wave impedance in the waveguide.

Q.9 An air-filled circular waveguide having an inner radius of 1cm is excited in dominant mode at 10GHz . Find

(i) cut-off frequency

(ii) Guided wavelength and wave impedance

(iii) band width for operation in dominant mode.

Q.10 Write a short note on Dominant and Degenerate modes. Also draw field patterns for dominant mode of rectangular and circular waveguide.

## UNIT 2

Q.11 Describe the term loaded Q, unloaded Q, critically coupled Q, over coupled Q with reference to cavity resonator.

Q.12Explain hybrid rings and circulators with the help of s-matrix.

Q.13Using s- matrix, briefly explain directional couplers. Hence find expressions for Coupling factor and Directivity.

Q.14 Obtain the s-matrix for a 3-port circulator and also prove that it is impossible to construct a perfectly matched lossless reciprocal 3-port junction.

Q.15 Explain magic-tees with the help of s-matrix. Also describe the magic of magic tees.

Q.16 Write a short note on waveguide bends, twists and corners.

Q.17 Compute the resonant frequency of a circular resonator of internal radius 6cm and length 5cm for (a) $TM_{012}$ mode and (b) $TE_{111}$mode, given that $X_{01}$=2.405 and $X'_{11}$ =1.841.

Q.18 A signal of power 32mW is fed into one of collinear ports of a lossless H-plane tee. Determine powers in remaining ports when other ports are terminated by means of matched loads.

Q.19 With the help of s- matrix, compare E-plane tee, H-plane tee and magic tee.

Q.20 Determine the length of cavity resonator which will resonate at 10GHz.Calculate Q-factor . Given : $\sigma = 6 * 10^{-7} \Omega m^{-1}$ , $\mu_0 = 4\pi * 10^{-7}$, $\varepsilon_0 = (36\pi * 10^{-9})^{-1}$

## UNIT 3

Q.21 By means of an Applegate diagram, explain the operation of a reflex klystron.

Q.22 A reflex klystron operates at the peak mode of n=2 with mode voltage= 300V, Beam current=20mA, signal voltage=40V. Determine:

(i) input power (ii) output power (iii) efficiency

Q.2 Explain construction and working of a two-cavity klystron amplifier. Hence derive the expression for velocity modulation and bunching process in it.

Q.24 Obtain expression for bunching parameter and optimum length for two cavity klystron.

Q.25 Show that the theoretical efficiency of reflex klystron is 27.78%.

Q.26 Explain the condition for obtaining power output of a reflex klystron. With the help of electronic admittance diagram explain electronic tuning.

Q.27 what is transit angle effect. Prove that its limitations in vacuum triode became the working principle in klystrons.

Q.28 A reflex klystron operates as $V_o$=500V, $R_{sh}$=20KΩ,$f_r$=8GHz, L=1mm(spacing between repeller and cavity. Tube is oscillating at the peak of n=2 mode. Assume that the transit time through the gap and the beam loading effect can be neglected. Find:

(i) Repeller voltage (ii) electronic efficiency

(iii) dc necessary to give microwave gap voltage of 200V.

Q.29 Derive the expression for induced current in the catcher for two- cavity klystron.

Q.30 A reflex klystron has: $V_{dc}$= 1.4KV, repeller voltage $V_r$= -100V, resonant frequency $f_r$= 8GHz, distance between cavity and repeller L=2cm. Compute: (a) The round trip d.c. transit time

(b) d.c. electron velocity

## UNIT 4

Q.31 what are slow-wave structures? Why does the TWT need such a structure?

Q.32 Explain why an attenuator is sometimes placed midway along the slow wave structure. What is the main advantage of the TWT amplifier compared to the klystron amplifier?

Q.33 Given: voltage Vo=3KV , Beam current Io=30mA , frequency f=10GHz , circuit length N= 50 , characteristic impedance of helix Zo= 10Ω. Determine (a) Gain parameter (b) Output power gain Ap (in db) (c) all four propagation constants.

Q.34 An O-type helix TWT tube operates at 9GHz. The slow wave structure has pitch angle of $4.4^{o}$ and an attenuation constant of 2Np/m. Determine the propagation constant of the wave in tube..

Q.35 Describe with necessary theory the amplification of microwaves by O-type traveling wave tube. How is it superior to two cavity klystron.

Q.36 Determine how the axial electric field of slow-wave helix is affected by the spatial ac electron beam current. Determine all propagation constants.

Q.37 Explain the operation of coupled cavity traveling wave tube.

Q.38 A TWT has following characteristics: beam voltage, $V_0$= 2Kv, beam current, $I_o$= 20mA, frequency f=8 GHz, circuit length N=40, characteristic impedance $Z_o$= 50Ω. Determine: (i) Gain parameter (ii) Efficiency

Q.39 Explain the modes of a helix type TWT and show that output power gain is: $A_p$= -9.54+47.3NC, where symbols have their usual meanings.

Q.40 Describe the electrical equivalent of a helix slow wave structure. Hence briefly describe the advantages and disadvantages of helix type and coupled cavity slow wave structures.

## UNIT 5

Q.41Explain construction of a magnetron. Derive Hull cut-off voltage equation and explain the process of generation of microwaves by a cavity magnetron operated in π-mode.

Q.42 How is strapping of a magnetron useful for separation of modes? What do you understand by weight of strapping?

Q.43 Explain the working of backward-wave crossed-field oscillator. Derive the expression for condition of oscillation.

Q.45 It is assumed that electrons in an inverted cylindrical magnetron leave the interior of the coaxial cathode with initial velocity caused by thermal voltage $V_t$. Find the initial velocity required for the electrons to just hit the anode at the centre conductor.

Q.46 what are cross-field devices? How does a magnetron sustain its oscillations using this cross field? Assume π-mode for explaining the same.

Q.47 A pulsed cylindrical magnetron is operated with an anode voltage=20KV, beam current 20A, magnetic field density B=0.35Wb/$m^2$, radius of cathode and anode are 5 and 10cm respectively. Find:

(i) Angular frequency (ii) Cut-off voltage (iii) cut-off magnetic field intensity

Q.48 Explain the following terms: (i) mode jumping and mode separation

(ii) frequency pulling and pushing in magnetron.

Q.49 Describe the coaxial frequency agile and voltage tunable magnetrons.

Q.50 An X-band pulsed cylindrical magnetron has following parameters:

Anode voltage, $V_o$=26KV , Beam current $I_o$= 27A, magnetic flux density $B_o$=0.336Wb/$m^2$, radius of cathode cylinder, a=5cm, radius of vane-edge to center, b =10cm. Compute: (i) cyclotron angular frequency

(ii) cut-off voltage for a fixed $B_o$

(iii) cut-off magnetic flux density for a fixed $V_o$

**********

# Question Bank for B.Tech, V Sem. End-Term Examination, 2014

## Subject: Microprocessor and microcontroller (EC 502/EE502/CS401)

### UNIT-1

Q.1 (a) Differentiate low-level and high level languages. Also discuss their advantages and disadvantages.

(b) Differentiate Complier and Interpreter.

Q.2 Define:-

(a). Tri state buffer, Decoder, Encoder, Latch?

(b). Microprocessor, Microcomputer & Microcontroller?

Q. 3 (a) what is the need of demultiplexing the bus $AD_7$-$AD_0$ in 8085? Explain demultiplexing of bus with the help of schematic diagram.

(b) Explain the different type of Buses in 8085?

Q.4 Explain the control and status signals available with 8085.

Q.5 Explain the Pin Diagram of 8085 with the help of neat diagram?

Q.6 Classifies all input and output signals of 8085 according to various categories.

Q.7 (a) What is memory? Explain memory organization?

(b) Interface 1-k bytes of r/w memory map from3000H to33FFH.

Q.8 Explain the Internal Architecture of 8085 with the help of block diagram?

Q.9 (a) Define the term flag in 8085 and how the flags are affected?

(b) Accumulator data is $(3A)_h$ and Register B contain is $29_h$ and addition operation is perform , which flags are change.

Q.10 (a) What are the function of Accumulator, Stack Pointer, program Counter.

(b) Define the term RISC and CISC.

### UNIT-2

Q.1 What is interrupts. Explain all types of interrupts in 8085.

Q.2 Explain and differentiate the peripheral mapped I/O and memory mapped I/O?

Q.3 (a) Calculate the address size, data size, address range of following memory
i) 2 KB ii) 1 KB iii) 256 Bytes
(b) Interface any one memory from above with 8085.

Q.4 Explain the following instructions and draw the timing diagram of **anyone**.
i) LDAX ii) DAD iii) SHLD iv) RLC v) MVI

Q5 Explain various instructions with its timing diagram **anyone.**
(i ) RET (ii) CALL (16 bit address) (iii) STA 7050H (iv) LXI Rp, 2050

Q.6 Explain the various registers in Programming model of 8085 microprocessor?

Q.7 How many types of instructions are available in 8085? Explain classification of instruction.

Q.8 Calculate size, machine cycle, T-State of following instruction
(i) JNZ (ii) CALL (iii) NOP (iv) XTHL
Draw timing diagram of **any one**.

Q.9 Explain different Addressing modes of instruction in 8085 with example?

Q.10 Explain the term machine cycle and T-state. What are the basic machine cycles in 8085? Explain the opcode-fetch machine cycle using timing diagram with an example.

**UNIT-3**

Q.1 Write the assembly language program using 8085 for following;
(a) The sum of two 8-bit numbers as 23h and A4h.
(b) The difference of two 8-bit numbers as d4h and 67h.

Q2. (a) ) find 2's compliment of following number.
(i) 00100011 (ii) 00110101
(b) Write an Assemble Language Program to Find 2's compliment of a number.

Q.3 Write an assembly language program to multiply two 8 bit data stored at location 2050H.

Q.4 Write a program to add two 16 bit numbers ABCD h and 1234 h and store at location 2100 H and 2101 H, also show added value.

Q 5. Write an Assembly Language program to Sort the given 10 Numbers in ascending order.

Q.6 Write an Assemble Language program to transfer a memory block of 10 numbers to another memory location in reverse order.

Q.7 Write an Assemble Language program to transfer a memory block of 10 numbers to another memory location in forward order.

Q.8 Write an Assemble Language program to find party of a 32-bit number.

Q.9 Write an Assemble Language Program to generate a Fibonacci numbers.

Q. 10 Write an Assemble Language program to search a number in an array.

Q.11 Write an Assembly Language program to Sort the given 10 Numbers in Descending order

## UNIT-4

Q.1 (a) Explain 8255 PPI with the help of block diagram.?
(b) List the operating modes of 8255 PPI.

Q.2 Draw the PIN diagram of 8253 PIT and also brief the mode of operation of 8253.

Q.3 Draw the pin diagram of 8253 IC with Pin Configuration.?

Q.4 Draw the pin diagram of 8279 and explain each pin briefly.

Q.5 With the help of block diagram, explain the working of DMA controller in detail.

Q.6 (a) Draw the interfacing diagram of 8257 DMA controller and explain its operation.
(b) Explain TIMER IC with its internal architecture.

Q.7 Write a short note on:-
(a) 8254, Programmable Interrupt controller.
(b) 8259, Programmable peripheral controller.

Q 8 (a) Explain the block diagram of 8259 chip. Explain the specific purpose of different block in the 8259 block diagram.
(b) Explain the priority mode of 8259.

Q.9 Explain various programming model of 8279 Keyboard and Display controller. Also draw a block diagram showing its interface with microprocessor.

Q.10 Draw and explain the pin diagram of DMA controller.

## UNIT-5

Q.1 (a) Draw and explain the Pin Diagram of 8051 microcontroller?
(b) Describe function PSEN, EA, XTAL1 & XTAL2 pins of 8051 Microcontroller.

Q.2 (a) Draw the format of TMOD register and write the function of each bit.
(b) Describe all mode of timer of 8051 microcontroller.

Q.3 (a) Explain the Machine Cycle , Pulse time and T States.
(b) Explain structure of TCON, TMOD and PCON Registers of 8051 microcontroller.

Q.4 What are the different addressing modes of 8051 microcontroller? Explain each with Suitable examples.

Q.5 (a) Describe Registers of microcontroller. Explain Register Banks of 8051?
(b) Explain in brief (i) Baud rate (ii) PSW (iii) Overflow

Q.6 Describe the interrupt of 8051 microcontroller, also explain IE and IP register of interrupts?

Q.7 Draw the Internal Architecture of 8051 microcontroller.

Q.8 Write short note on-
(a)Timer/ Counter (b) USART (c) SBUF (d) DPTR

Q.9 Describe the SFR's of microcontroller 8051?

Q.10 Explain SCON register. Explain all mode of serial communication and roll of baud rate.

# Question Bank for B.Tech. V Sem. End-Term Examination, 2014

## Subject: Digital Communication (EC-503)

### UNIT-I

Q.1 What is digital modulation? Explain types of digital modulation.

Q.2 What is regenerative repeater? Explain the pulse code Modulation and demodulation.

Q.3 what is adaptive delta modulation and demodulation?

Q.4 Explain the slope overload distortion and Ideal noise in the case of Delta modulation.

Q.5 Derive an expression for signal to quantization noise ratio for a PCM System which employs linear (i.e. uniform) quantization technique. Given that input to the PCM system is a sinusoidal signal.

Q.6 In a binary PCM system, the output signal-to-noise ratio is to be held to a minimum value of 40 dB. Determine the number of required levels, and find the corresponding signal-to-quantizing-noise ratio.

Q.7 Explain the Necessity of Nonuniform quantization. Explain companding in detail.

Q.8 A delta modulator system is designed to operate at five times the Nyquist rate for a signal having a bandwidth equal to 3 kHz bandwidth. Calculate the maximum amplitude of a 2 kHz input sinusoidfor which the delta modulator does not have slope over load. Given that the quantizing step size is 250 mV.

Q.9 The BW of an input signal to the PCM is restricted to 4KHz. The input signal varies in amplitude from -4.5V to +4.5V and has the average power of 40mW. The required signal to noise ratio is given as 30db.The PCM modulator produce binary output. Assuming that uniform quantization,

(i) Find the number of bits required per sample.

(ii) Outputs of 40 such PCM coders are time multiplexed. What be the minimum required transmission BW for this multiplexed signal?

Q.10 what is Differential pulse code modulation and demodulation?

**UNIT-II**

Q.1 Given the binary sequence 11000101, draw the transmitted pulse waveform for (i) AMI, (ii) Polar RZ, (iii) Polar NRZ and (iv) Split-phase (Manchester) (v) M-ray signaling format

Q.2 Explain the following:

(i) Inter symbol Interference

(ii) Eye Pattern

Q.3 Explain the pulse shaping and raised cosine filter.

Q.4 In a certain telemetry system, eight message signals having 2 kHz bandwidth each are time division multiplexed using a binary PCM Technique. The error in sampling amplitude cannot be greater than 1 % of the peak amplitude. Determine the minimum transmission bandwidth required if raised cosine pulse with roll-off factor $\alpha = 0.2$ are used. The sampling rate must be at least 25 % above the Nyquist rate.

Q.5 Given the binary sequence 10110001, draw the transmitted pulse waveform for

(i) AMI, (ii) Polar RZ, (iii) Polar NRZ

(iv) Split-phase (Manchester) (v) M-ray signaling format

Q.6 Explain the following line coding technique with suitable example

(i) AMI, (ii) Polar RZ, (iii) Polar NRZ and (iv) Split-phase (Manchester) (v) M-ray signaling format.

Q.7 Explain the Nyquist criterion for distortion less base band binary transmission system.

Q.8 A Communication channel of bandwidth 75 kHz is required to transmit binary data at a rate of 0.1Mb\s using raised cosine pulses. Determine the roll-off factor $\alpha$.

Q.9 what is line coding? Explain its properties.

Q10. Write short note on following-

(a) High density bipolar signaling

(b) B8ZS line code

**UNIT-III**

Q.1 Derive an expression for the error probability of matched filter.

Q.2 Explain the Binary phase shift keying. What are modulation and Demodulation techniques for BPSK.

Q.3 Write short on comparison of ASK, PSK and FSK.

Q.4 Describe the generation and detection digital information by differential Phase shifting keying.

Q.5 Explain the generation and demodulation of QPSK.

Q6.Describe the types of digital modulation techniques.

Q.7 finds out the error probability in BPSK.

Q.8 Binary data is transmitted at a rate of $10^6$ bits\sec over a channel having a $10^{-10}$ W\Hz. Determine the average carrier amplitude required at the receiver is $N_0\2$ coherent PSK and DPSK signaling schemes to maintain $P_e < 10^{-4}$.

Q.9 Derive an expression for the error probability of QPSK.

Q.10 Give the comparison of digital modulation schemes.

**UNIT-IV**

Q.1 Find the code word length, code word efficiency and code redundancy with the help of Shannon –Fano coding. Where

p(x1) =.25, p(x2) =.20, p(x3) =.20 , p(x4) =.15,
p(x5) =.10, p(x6) =.05, p(x7) =.05

Q.2 Find the code word length, code word efficiency and code redundancy With the help of Huffman encoding. Where

p(x1) =.25 p(x2) =.20 p(x3) =.20 p(x4) =.15
p(x5) =.10 p(x6) =.05 p(x7) =.05

Q.3 the probabilities of the five possible outc**o**mes of an experiment are Given as p(x1) =1/8 p(x2) =1/8 p(x3) =1/4 p(x4) =1/4 p(x5) =1/4. Determine the entropy and information rate if there are 16 outcomes per second.

Q.4 Explain the capacity of Capacity of a Gaussian Channel.

Q.5 A source produces one of four possible symbols during each interval having probabilities $P(x_1) = 1\backslash 2$, $P(x_2) = 1\backslash 4$ , $P(x_3) = P(x_4) = 1\backslash 8$. Obtain the information content of each of these symbols.

Q.6 Calculate the amount of information if binary digits occur with equal likelihood in a binary PCM system.

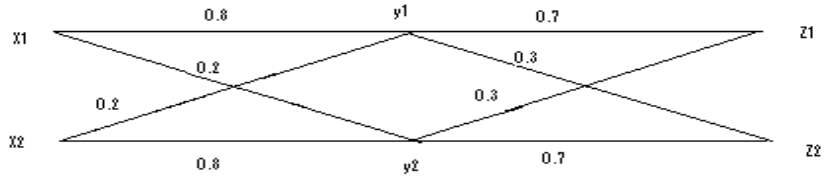
Q.7 A high – resolution black & white TV picture consist of about $2 * 10^6$ picture elements and 16 different brightness levels. Pictures are repeated at the rate of 32 equal likelihood of occurrence. Calculate the average rate of information conveyed per second. All picture elements are assumed to be independent and all levels have by this TV picture source.

Q.8 Explain types of channel with proper matrices.

Q.9 Two BSCs are connected in cascade, as shown in figure below.

(i) Find the channel matrix of the resultant channel.

(ii) Find P(z1) and P(z2) if P(x1) = 0.6 and P(x2) = 0.4




Q.10 Verify the following expression: $H(X,Y) = H(X|Y) + H(Y)$

Q.11 given an AWGN channel with 4kHz bandwidth and the noise power spectral density $\eta \backslash 2 = 10^{-12}$ W\Hz. The signal power required at the receiver is 0.1 mW. Calculate the capacity of this channel.

**UNIT-V**

Q.1 The parity check matrix (H) of a particular (7, 4) linear block code is Given by

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 |

i) Find the Generator matrix

ii) Find all the code vectors.

iii) How many errors can be detected? How many errors can be corrected?

Q.2 The generator polynomial of a (7, 4) cyclic code is G (p) = $p^3 + p + 1$. Find all the code vectors for the code in systematic form.

Q.3 The generator polynomial of a (7, 4) cyclic code is G(p) = $p^3 + p + 1$. Find all the code vectors for the code in systematic form.

Q.4 what are the error detection and error correction code? Classify the error correcting codes.

Q.5 The generator matrix for a (6,3) block code is given below. Find all the code vectors of this code.

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 |

Q.6 For a code vector X = (0111000) and the parity check matrix H given below,

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 |

Prove that $XH^T = (0, 0, \ldots.., 0)$

Q.7 The parity check matrix of a (7,4) hamming code is as under:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 |

Calculate the syndrome vector for single bit errors.

Q.8 for a systematic linear block code, the three parity check digits, $C_4$, $C_5$ and $C_6$ are given by-

$C_4 = m_1 \quad m_2 \quad m_3$

$C_5 = m_1 \quad m_2$

$C_6 = m_1 \quad m_3$

(1) Construct generator matrix.
(2) Construct code generated by this matrix.
(3) Determine error correcting capability.
(4) Prepare a suitable decoding table.
(5) Decode the received words 101100 and 000110.

Q.9 The generator polynomial of a (7, 4) cyclic code is G (p) = $p^3 + p + 1$.Find all the code vectors for the code in systematic form.

Q.10 Explain the Convolution encoding.

# Question Bank for B.Tech. V Sem. End-Term Examination, 2014

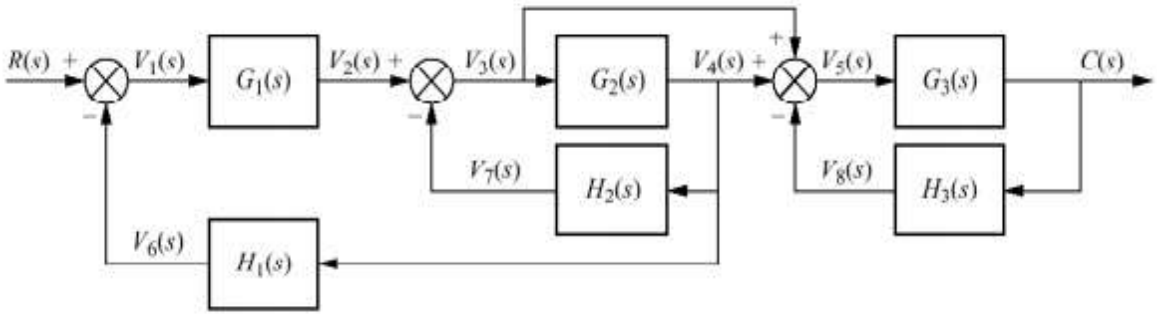
# Subject: Control System (EC504/EE503)

**UNIT I**

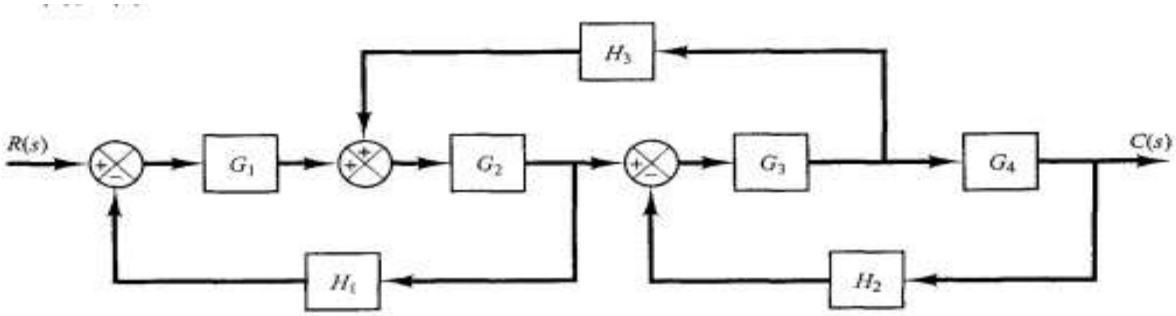
Q1. What do you mean by the control system & explain the open loop and close loop system?

Q2. Explain the multivariable control system with proper diagram?

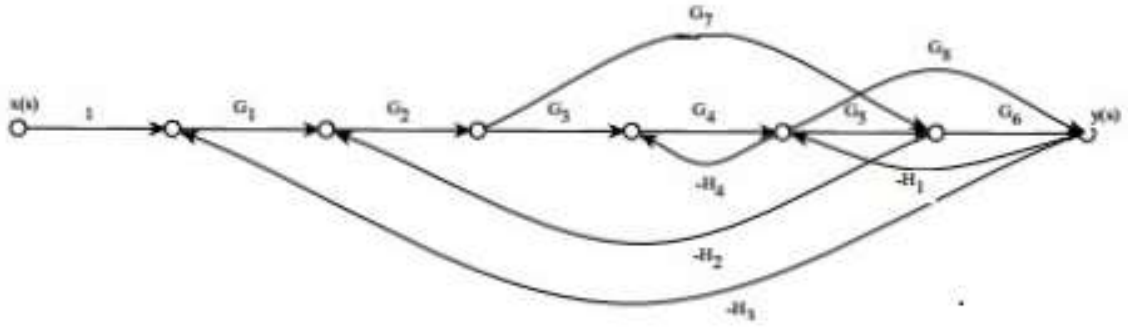
Q3. Reduce the block diagram given below



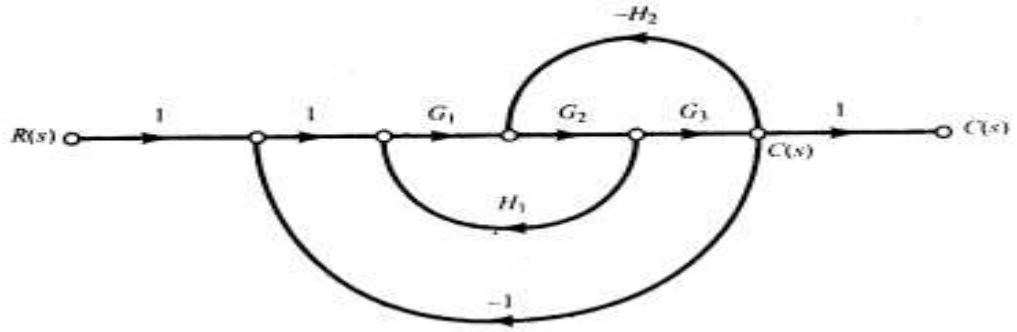

Q4. Merge the block diagram by block diagram reduction technique



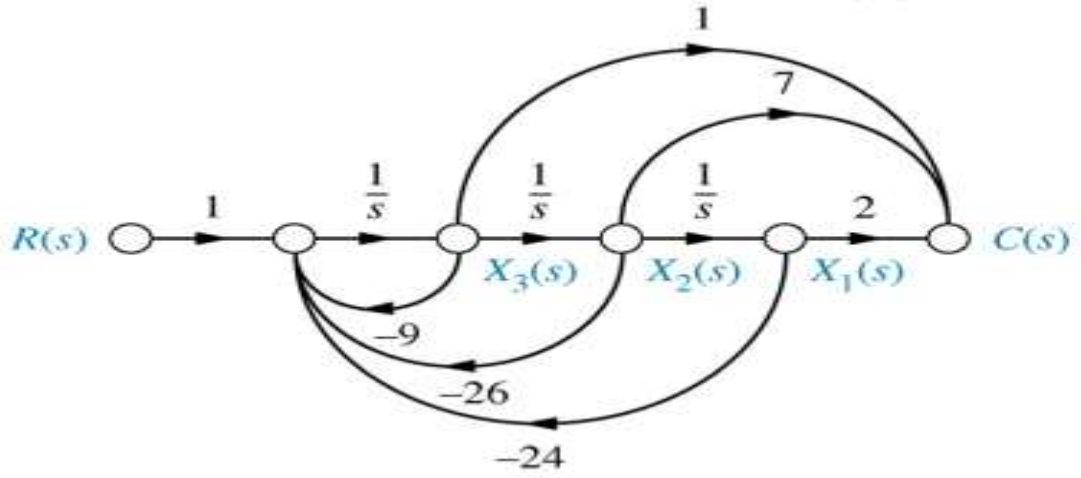

Q5. Find the transfer function of the signal flow diagram by the mason's gain formula



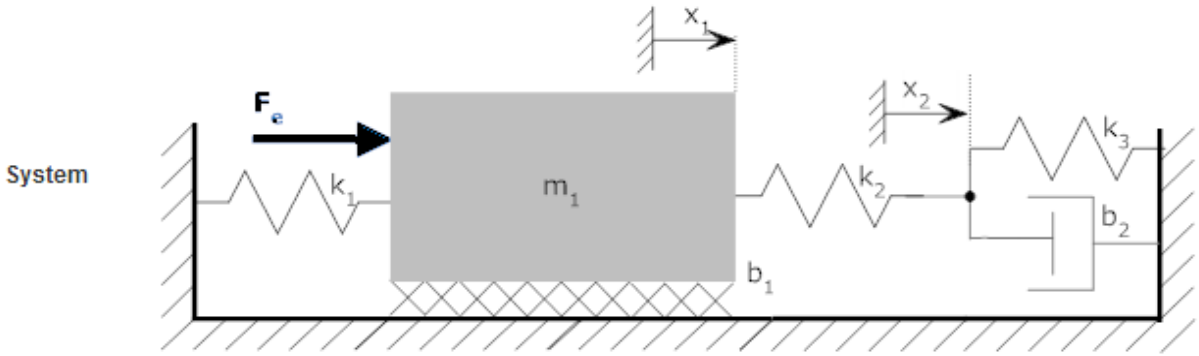

Q6. Find the transfer function of the signal flow diagram by converting the signal flow diagram in to block diagram



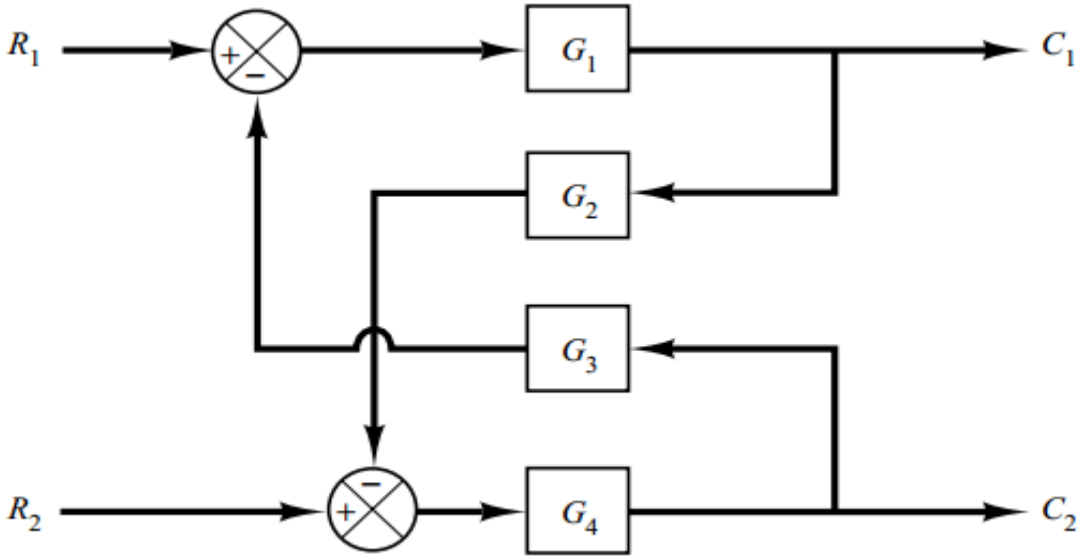

Q7. Find the transfer function of the signal flow diagram by converting the signal flow diagram in to block diagram



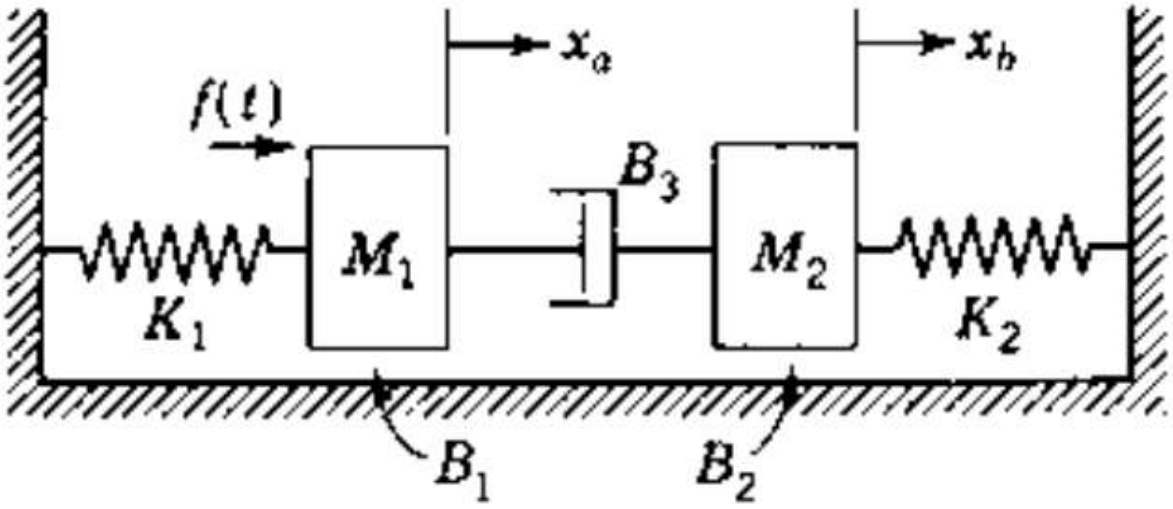

Q8. Determine the transfer function relating the $x_1(s)$ to $F_e$ for the mechanical system shown in figure




Q9. Reduce the block diagram




Q10. Reduce the mathematical model by the nodal method and explain each step in detail




**UNIT II**

Q1. Shows that the steady state error of the first order system is "T" when unit ramp signal is given to
the input of the system?

Q2.Deduce the time response of the second order system for over damped condition?

Q3. Show that the steady state response of the second order is zero?

Q4. What do you mean by the transient response specification and deduce all the parameters?

Q5. Show that the time lagging of the second order system is $\frac{2\delta}{\omega_n}$ when an unit ramp signal ($\frac{1}{s^2}$) is given?

Q6. State and derive all the static error coefficients?

Q7.Find the time response of a standard second order system to a step input when $\delta = 0$.

Q8. A damped system with a natural frequency of 4rad/sec has a damping ratio $= 0.4$. Find the time taken from the start of a step change to when the output overshoots by 20% for the first time?

Q9.A record of a damped oscillation is made and it is determined that the periodic time is 0.2sec and that the ratio of two successive amplitudes is 20mm & 5mm. calculate the natural frequency and damping ratio?

Q10. An open loop system with initial feedback has an open loop transfer function of $G(s) = \frac{2}{s(s+1)(s+2)}$. Find the steady state error when $\theta_i(t) = 1 + 0.2t$?

**UNIT III**

Q1. What is the significance of the frequency domain and why we use the bode plots?

Q2. What do you mean by the Gain and Phase Margins and how we find them?

Q3. Draw the bode plot of the following $G(s) = \frac{4}{(s^2+s+4)}$ ?

Q4.Draw the frequency response of the system by given transfer function

$$G(s) = \frac{10}{s(s^2+0.4s+4)}$$

Q5.Sketch the bode plot for the unity feedback system characterized by the open loop transfer function

$$G(s) = \frac{1000}{(1+0.1s)(1+0.001s)}$$

Q6. Construct bode plot for the system whose open loop transfer function is given below

a) Gain margin

b)Phase margin c)Close loop stability

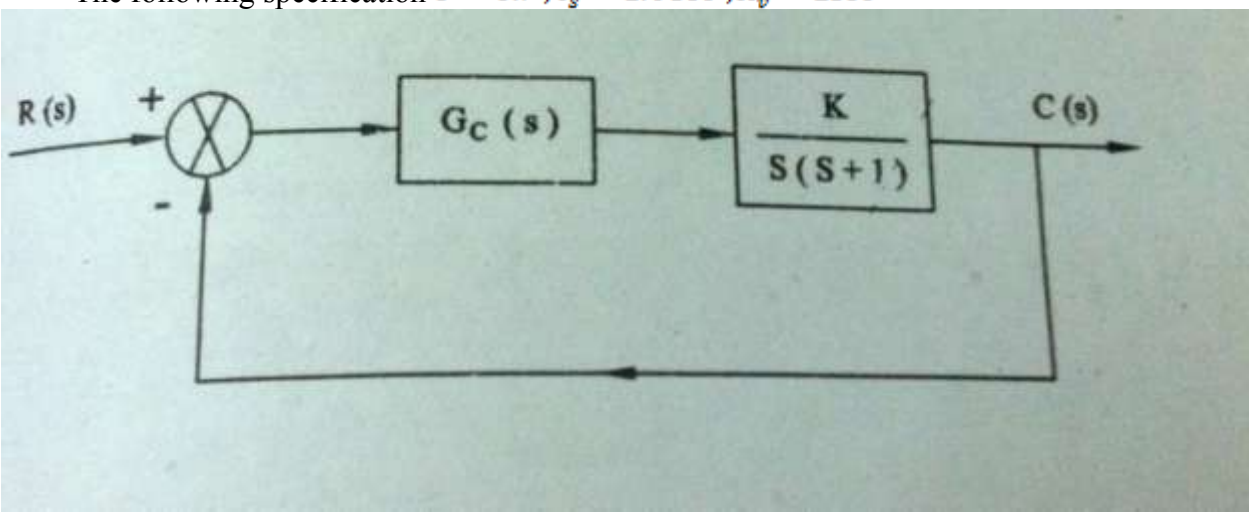
$$G(s) = \frac{4}{s(1+0.5s)(1+0.08s)}$$

Q7. Draw the frequency response curve of the given transfer function

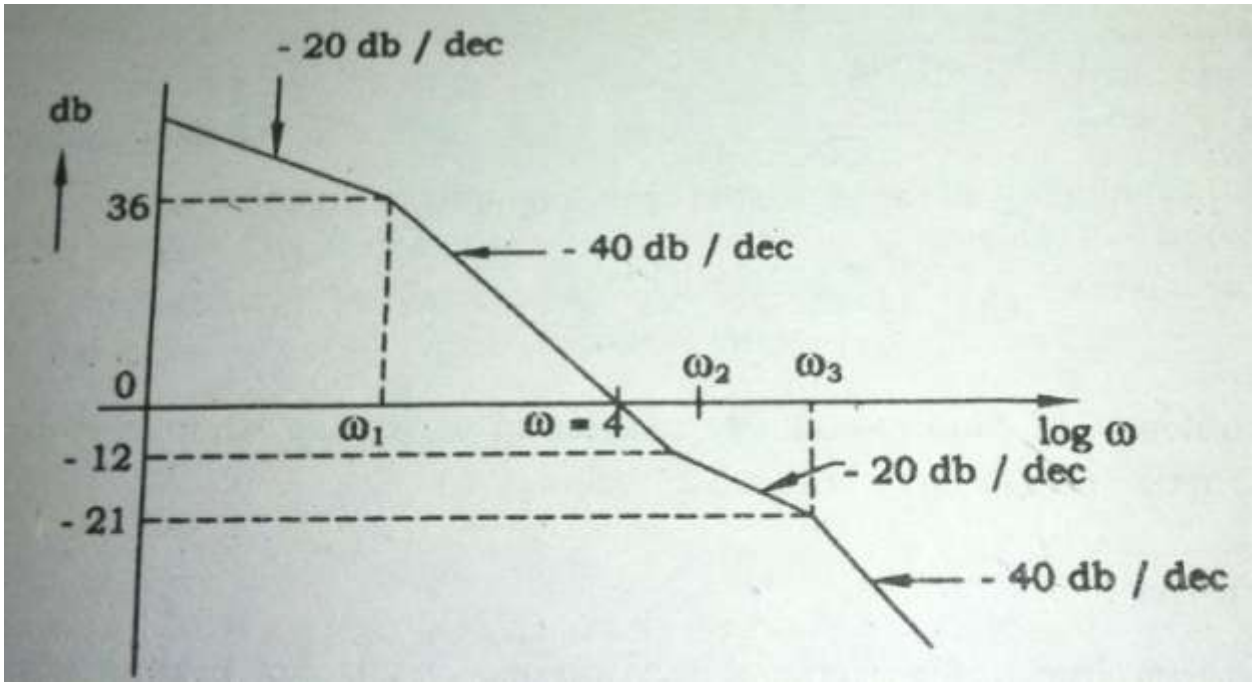
$$G(s) = \frac{2e^{-j0.5\omega}}{j\omega(1+0.5j\omega)(1+0.125j\omega)}$$

Q8. Consider the system shown in the figure design the lag compensator of this system to meet

The following specification $\delta = 0.7$ , $t_s = 1.4\,\text{sec}$ , $K_v = 2sec^{-1}$

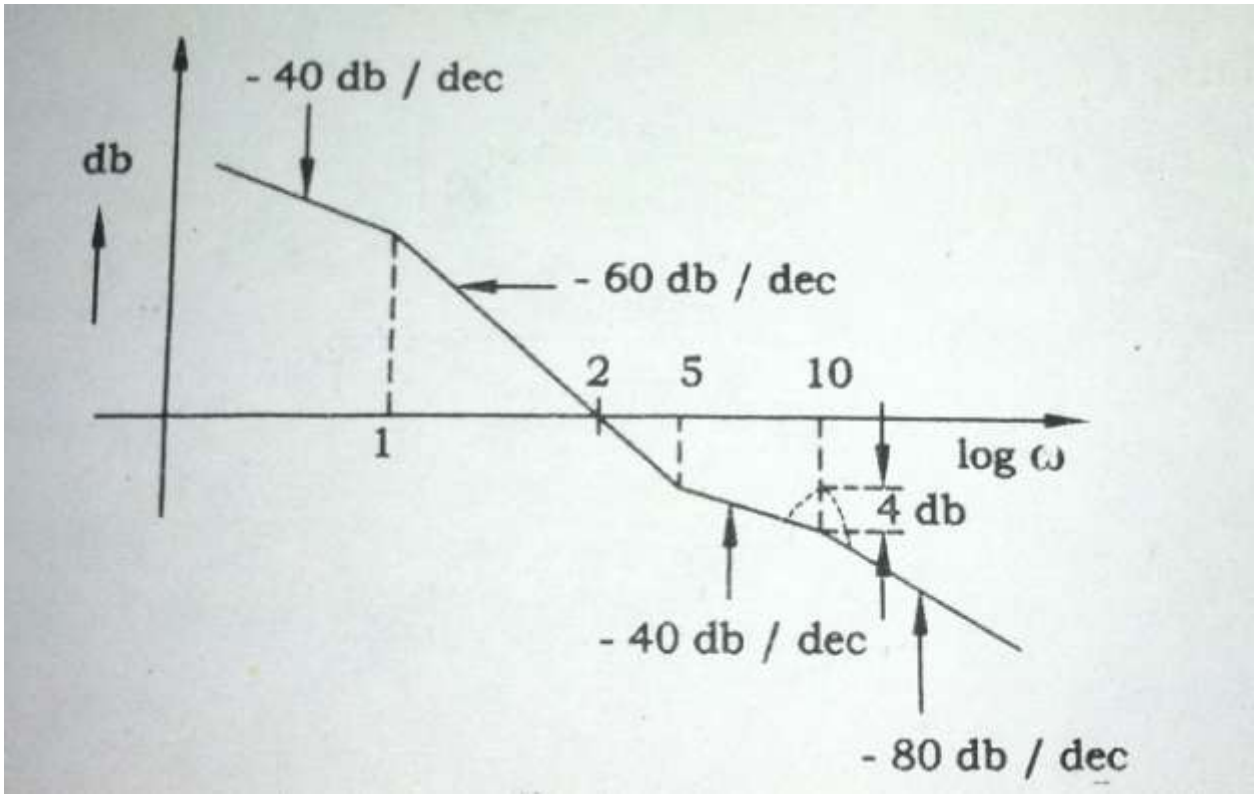



Q9. Derive the transfer function of the system from the data given on the Bode diagram Shown in figure




Q10. Obtain the expression for open loop transfer function for a system with unity feedback

Whose log-magnitude plot is given below



**UNIT IV**

Q1. What do you understand by the absolute and relative stability?

Q2. Find out the value of the K by Routh Stability method $H(s) = \frac{K}{s(s^2+s+1)(s+2)+K}$ ?

Q3. Find out the stability of the system by routh stability method

$s^5 + 2s^4 + 24s^3 + 48s^2 - 50$

Q4. Sketch the root locus of a control system having open loop transfer function ?

$G(s) = \frac{K}{83.33(s+0.001)(s+2)(s+6)}$

Q5. Find out the break away point , find the line for $\delta = 0.5$ and value of K of this damping Ratio and if frequency at which root locus crosses the imaginary axis with the Corresponding value of K?

$G(s) = \frac{K}{s(s+2)(s+5)}$

Q6. We have an close loop system having open loop transfer function

$G(s)H(s) = \frac{K}{s(s-1)}$ Determine the stability of the system by Nyquist stability criteria?

Q7. Find out the stability of the open loop transfer function by Nyquist stability criteria?

$G(s) = \frac{s+1}{s^2(s-2)}$

Q8. Write short note on the M and N loci?

Q9.The open loop transfer function of a unity feedback control system is given by

$G(s)H(s) = \frac{K(s+5)(s+40)}{s^3(s+200)(s+1000)}$

Discuss the stability of the control system as a function of K , determine values of K Which will cause sustained oscillations in the closed loop system ?

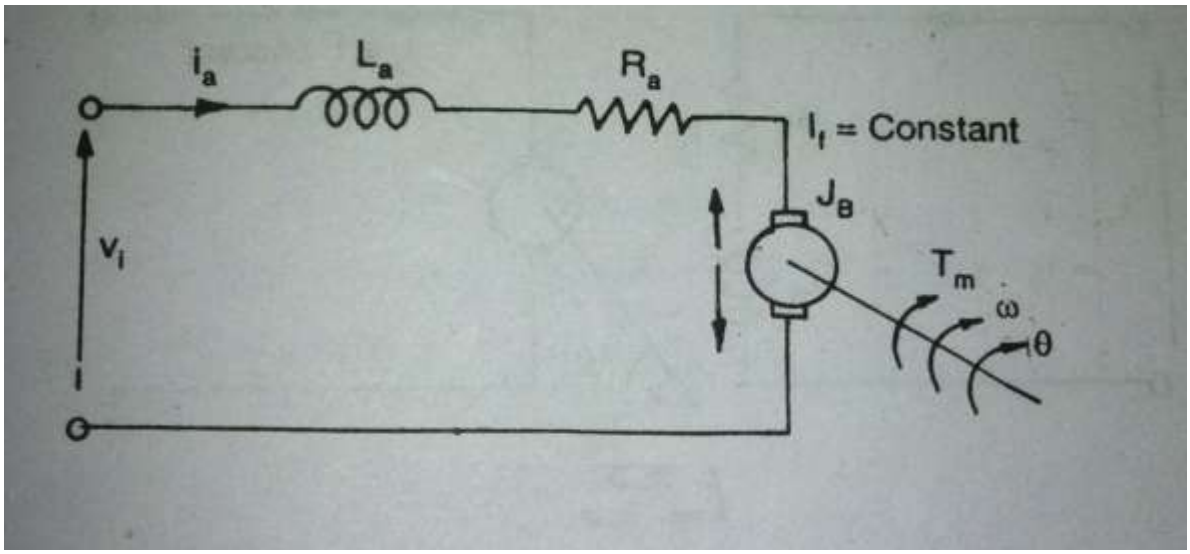
Q10. The characteristics equations for a certain feedback system is given by

$s^4 + 22s^3 + 10s^2 + 2s + K = 0$ , find the value of the K for which system is stable?

**UNIT V**

Q1. Explain the concept of the state variable with example?

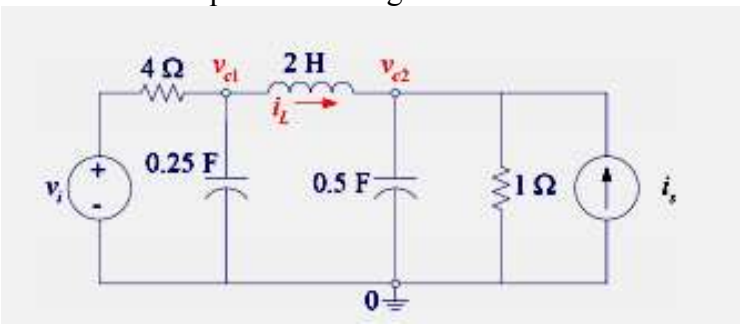
Q2. Obtain state variable representation of an armature controlled DC motor and field controlled DC motor




Q3. Obtain the state equation in phase variable form for the following differential equation

$$2\frac{d^3y}{dt^3} + 4\frac{d^2y}{dt^2} + 6\frac{dy}{dx} + 8y = 10u(t)$$

Q4. Write the state equation of the given circuit




Q5. Obtain the transfer function for the system described in the below state space model

$$\begin{matrix}\dot{x}_1 \\ \dot{x}_2\end{matrix} = \begin{matrix}0 & 1 \\ -6 & -5\end{matrix} \begin{matrix}x_1 \\ x_2\end{matrix} + \begin{matrix}0 \\ 1\end{matrix} u(t)$$

$$y = \begin{matrix}8 & 1\end{matrix} \begin{matrix}x_1 \\ x_2\end{matrix}$$

Q6. Diagonalize the system whose state model is given below

$$\dot{x} = \begin{matrix}3 & 4 \\ 2 & 1\end{matrix} x + \begin{matrix}0 \\ 1\end{matrix} u$$

$$y = \begin{matrix}8 & 1\end{matrix} x$$

Q7. A feed back system has a closed loop transfer function $\frac{10(s+4)}{s(s+1)(s+3)}$ Construct the state model and its representation?

Q8. Determine the state controllability and observability of the system of the system

$$\dot{x} = \begin{matrix}-3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1\end{matrix} x + \begin{matrix}0 & 1 \\ 0 & 0 \\ 2 & 1\end{matrix} u$$

$$y = \begin{matrix}0 & 0 & 1 \\ 1 & 1 & 0\end{matrix} x$$

Q9. Find the controllability and observability of the system whose transfer function is given

$$\frac{Y(s)}{U(s)} = \frac{2}{s^3+6s^2+11s+6}$$

Q10. Give a suitable state variable representation for the system described by the following

Third order differential equation $[\dddot{y} + 2\ddot{y} + 5\dot{y} + y = 10]$

# Question Bank for B.Tech.V Sem. End-Term Examination, 2014

# Subject: DIGITAL SIGNAL PROCESSING(EC505)

**UNIT 1:**

1. Using Paley-Wiener Criterion, show that $|H(j\omega)|=e^{-\omega 2}$ is not a suitable amplitude response for a causal LTI system

2. Explain Frequency Response of Stable Systems
The difference equation for the low pass filter is given as,

$$y(n) = \frac{x(n) + x(n-1)}{2}$$

Obtain the magnitude/phase transfer function plots for this filter.

3. (a) Check whether y(n)=ax(n)+b is BIBO stable or not?
(b) Compute the convolution y(n)= x(n)*h(n) for x(n)=u(n) and h(n)= $a^n$u(n), ROC: |a|<1 ; n≥0.

4. A discrete time causal LTI system has the system function
H (z) = 1-$a^{-1}z^{-1}$/1-$az^{-1}$
Where 'a' is real

(i) For what range of value of 'a' is the system stable

(ii) Show that the system is an all pass system i.e. the magnitude of the frequency response is constant .Also specify the value of the constant

5. A difference equation of the system is given below

$$y(n) = 0.5\,y(n-1) + x(n)$$

Determine (i) System function, (ii) Pole zero plot of the system function

6. Determine the response y(n),n ≥0 of the system described by the second order difference equation

y(n) -3y(n-1)-4y(n-2)=x(n)+2x(n-1)

When the input sequence is
x(n) = $4^n$u(n)

7. Determine the range of values of the parameter *'a'*, for which the linear time invariant system with impulse response $h(n) = a^n u(n)$ is stable.

8. Find the impulse response of the causal system $y(n)-5y(n-1)=x(n)+x(n-1)$ with all initial conditions zero.

9. Obtain the response of the system described by the following equation.
$y(n) = 0.85\,y(n-1) + 0.15\,x(n)$ for the inputs,
(i) $x(n) = u(n)$
(ii) $x(n) = (-1)^n u(n)$

10. Expalin the classifcation of the system with their one example .
Expalin the following term:
(i) All pass system
(ii) Minimun phase sytem
(iii) Linear system withlinear phase

**UNIT 2:**

1. (a) Explain DFT as Linear Transformation
(b) Prove Time shifting and Circular Shift property

2. Explain Circular Convolution .Determine the circular convolution of the following sequence x(n) = {1,2,3,4}, h(n) = {4,3,3,2}Find DFT and IDFT

3. Derive DFT of the sample data sequence x(n) = {1,1,2,2,3,3} &compute the corresponding amplitude & phase response.

4. Find 8-point DFT of the sequence

X(n) = { 0.707,1,.707,0,-.707,-1,-0.707,0}

By using DIF radix-2 FFT find X (k).

5. Explain the differences between Linear and Circular Convolution. Determine the circular convolution of following sequences and compare the results with linear convolution.
*x(n) = {1, 1, 1, 1, - 1, - 1, - 1, - 1}* and *h(n) = {0, 1, 2, 3, 4, 3, 2, 1}*

6. Determine the following sequence $y(m) = x(n) \textcircled{N} h(n)$ where
$x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{4, 3, 2, 2\}$
($\uparrow$ under the first term of $x(n)$; $\uparrow$ under the first term of $h(n)$)

7. With the help of the flow graph derive and expression for an 8 - point decimation - in – Frequency algorithm.

8. With the help of the flow graph derive and expression for an 8 - point decimation - in – Time algorithm

9. Given $x(n)=2^n$ and N=8. Find DIT FFT algorithm

10. Write short notes on any two:
(a) Decimation-in frequency FFT Algorithms
(b) Vocoders,
(c) Linear predictive coders.

**UNIT 3:**

1.(a) Explain the Magnitude respopnse and phase response of digital filters.

(b) The following transfer function characterstics an FIR filter (M=11) .Determine the magnitude response and show that the phase response and show that the phase and group delay are constant.

2.(a) Explain the rectangular window & Hamming window for FIR Filter design.
(b) A digital filter has the following impulse response:
$h(n) = \{-3, 2, 1, -2, 3\}$ If it is a linear phase filter, justify

4. (a)Design an IIR Filter using Bi-linear transformation Method
(b) A low pass filter is to be designed with the following desired frequency response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\pi/4 \le \omega \le \pi/4 \\ 0, & \pi/4 \le \omega \le \pi \end{cases}$$

Determine the filter coefficents $h_d(n)$ if the window function is defined as

$$W(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & \text{otherwise} \end{cases}$$

Also determine the frequency response $H(e^{j\omega})$ of the designed filter

5.(a) Design an IIR Filter using impulse invariance Method
A filter is to be designed with the following desired frequency response

$$H_d(e^{j\omega}) = \begin{cases} 0, & -\pi/4 \le \omega \le \pi/4 \\ e^{-j2\omega}, & \pi/4 \le \omega \le \pi \end{cases}$$

Determine the filter coefficents $h_d(n)$ if the window function is defined as

$$W(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & \text{otherwise} \end{cases}$$

Also determine the frequency response $H(e^{j\omega})$ of the designed filter

6. The desired frequency response of low pass filter is

$H_d(e^{j\omega}) = e^{-j3\omega}, \ -3\pi/4 \le \omega \le 3\pi/4$

$0 \ , \ 3\pi/4 \le \omega \le \pi$

Determine $H(e^{j\omega})$ for M =7 using hamming window compare the result with rectangular window.

7. Explain the Butterworth filters. Give basic design equations.

8. Explain the Chebyshev filters. What is the difference between type I and type II type of Chebyshev filters. Give basic design equations.

9. Perform a comparison of Analog and Digital Filters. Convert the analog filter to digital filter whose system function is

$H(s) = 36/(s + 0.1)^2 + 36$

10. What is imulse invartiant technique .Design a digital chebyshev filter to satisdfy the constraints

$0.707 \le H(e^{j\omega}) \le 1 , \quad 0 \le \omega \le 0.2\pi$

$H(e^{j\omega}) \le 0.1, \quad 0.5\pi \le \omega \le \pi$

Using bilinear tranformation and assuming T =1s

**UNIT 4:**

1. Determine a direct form I &direct form II realization of the following Linear Constant coefficient Difference equation:

$$y(n) = b_o x(n) + b_1 x(n-1) + b_2 x(n-2) + b_3 x(n-3) - a_1 y(n-1) - a_2 y(n-2) - a_3 y(n-3).$$

2. Obtain the direct Forms I and II realizations for a third-order IIR transfer function which is expressed as below:

$$H(z) = \frac{0.28\,z^2 + 0.319\,z + 0.04}{0.5\,z^3 + 0.3\,z^2 + 0.17\,z - 0.2}$$

3. (a)Explain how you will realize cascade form structures for infinite impulse response (IIR) Filters

(b) Explain various effects of finite word length on digital filter design

4. Realize the second order digital filter with following difference equation:
$y(n) = 2r\ \cos(\omega_0) y(n-1) - r^2 y(n-2) + x(n) - r\ \cos\ (\omega_0) x(n-1)$

5. Determine a cascade realization of the system characterised by the transfer function which is expressed as under:

$$H(z) = \frac{2(z+2)}{z(z\ -\ 0.1)\ (z\ +\ 0.5)\ (z\ +\ 0.4)}$$

6. Obtain the parallel form realization of the following IIR digital filter transfer functions:

$$H(z)\ =\ \frac{3(2z^2 + 5z + 4)}{(2z\ +\ 1)(z\ +2)}$$

7. Explain the Representation of structures using signal flow graphs. Given a causal LTI system with the following system function:

$$H(z)\ = \frac{1 + \frac{1}{5} z^{-1}}{\left(1 -\ 0.5z^{-1} + \frac{1}{3} z^{-2}\right)\left(1 + 0.25z^{-1}\right)}$$

Draw the signal flow graph for implementation of the system using direct form—II.

8.(a) What are the different types of structures of IIR systems realization?
(b) When cascade form realization is preferred in FIR filter?

9. Obtain the cascade and parallel reliastion structures for the following following signals
(a) y(n) = 3/4y(n-1) – 1/8y(n-2) + x(n) + 1/3x(n-1)
(b) y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) + 1/3x(n-1)

10. (a)Why do FIRfilter have inherent linear phase characteristics
(b) What is the necessary and suffidcient condition for the linear phase characterstics in an FIR filter

**UNIT 5:**

1.(a) What is Multirate Digital Signal Processing (MDSP)?What is the need for Multirate Digital signal processing?

(b) Consider the discrete signal x(n) = [ 2,4,6,8,10,12,14,16]

Determined the downsampled version of the signals for the sampling rate reduction factor

(a) D=2 (b) D =3

2. Write short notes on the following topics:

(a) Sampling ratre conversion

(b) Decimator

(c) Interpolator

3.(a) Explain the interpolation process for **an** integer factor I with an example.

(b) The transfer function of an FIR filter is

H(z) = 0.3 + 0.6z-1 + 0.7z-2 + 0.18z-3 + 0.85z-4 + 0.25z-5 + 0.28z-6

Perform polyphase decompostion of H(z) todecompose in 2section and 3section.

4.(a) Explain the Decimation process for an integer factor D with an example.

(b)Discuss the sampling rate conversion by a rational factor I/D

Q5.Discuss the concept of aliasing in spectrum of output signal of a decimator with an example. Explain polyphase decomposition process

6. (a)derive an experssion for the spectrum of output signal of a decimator & interpolator.

(b)Consider the discrete signal x(n) = [ 1,3,5,7,9]

Determine the sampled version of the signals for the sampling rate multiplcation factor at I= 2 & I= 3

7. The transfer function of an IIR filter is

H(z) = 1+0.85z-1/1-0.65z-1

Perform plyphase decompostion of H(z) to decompose into (a) 2 section (b) 4 section (c) 6 section

Q8.(a) List some applications of MDSP and explain any one

(b) The transfer function of an IIR filter is

H(z) = 1+ 0.32z-1 + 0.58z-2/1+ 0.7z-1 + 0.4z-2

Find H(z) and decompose into 2 section and 4section.

Q9. Explian the process of ployphase decompastion of an IIR filter with an example

Q10. Explian the process of ployphase decompastion of an IIR filter with an example.

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

# Subject: Microwave Engineering –II (EC601)

## Unit 1

**Q.1** A Shielded strip line has the following parameters: Dielectric constant of the insulator $\varepsilon_r$=2.56, strip width W=25 mils, strip thickness t= 14 mils, shield depth d= 70mils. Calculate: (a) the K factor (b) the fringe capacitance (c) the characteristic impedance of the line.

**Q.2** Explain (i) strip lines (ii) Micro strip lines

**Q.3**. A lossless parallel stripline has a conducting strip width w. The substrate dielectric separating the two conducting strips has a relative dielectric constant $\varepsilon_{rd}$=6 and a thickness of 4mm. Calculate: (a) required width of the conducting strip in order to have a characteristic impedance of 50Ω. (b) strip line capacitance and inductance (c) phase velocity of the wave.

**Q.4** Explain various losses in micro strip lines.

**Q.5** Explain how coplanar strip line is advantageous over conventional parallel strip line. Also explain Parallel line in brief.

**Q.6** A coplanar strip line carries an average power of 250mW and peak current of 100mA.determine the characteristic impedance of the coplanar strip line.

**Q.7** Calculate the characteristics impedance and attenuation of the stripe line with the following parameters: b=2mm,W=0.5mm,t=0,Er=6,loss tangent=0.006 and frequency of operation =5Ghz.what is the ration of the attenuation due to dielectric loss relative to that conductor.`

**Q.8** A gold parallel strip line has the following parameter: Relative dielectric constant of polyethylene: $\epsilon_{rd}$= 2.25; Strip width: W=25mm; Separation distance: d=5mm. Calculate the

(i) Characteristic impedance of the strip line

(ii) Strip line capacitance

Q.9 A micro strip line is constructed of a perfect conductor and a lossless dielectric board. The relative dielectric constant of the fiber glass epoxy board is 5.23, and the line characteristic impedance is 50Ω. Calculate the line inductance and the line capacitance.

Q.10 Explain coplanar strip lines in detail with the help of suitable diagrams.

## UNIT-2

**Q.1** Explain RWH theory for Gunn diode. Also describe the modes of operation for Gunn diodes.

**Q.2(a)** Explain with the help of energy band diagrams, working of Tunnel diode and its applications.

(b) Explain and derive negative differential resistance in Gunn diode.

**Q.3** Compare the performance of IMPATT and TRAPATT oscillators with that of Gunn oscillators and amplifiers. Consider also their relative applications.

**Q.4** A tunnel diode has negative resistance (R)= 26 Ω; series resistance($R_s$)= 1Ω and junction capacitance= 5nF. Calculate(a) resistive cut-off frequency (b) gain of amplifier (A), when the diode is used as an amplifier with a load of 240 Ω in parallel.

**Q.5** Explain and derive negative differential resistance in Gunn diode.

**Q.6** A typical n-type GaAs Gunn diode has threshold field $E_{th}$=2800V/cm; applied field E=3200V/cm; device length L=10μm; doping concentration $n_0=2*10^{14}$ $cm^{-3}$; operating frequency, f=10GHz.Compute (a) the electron drift velocity (b) current density (c) negative electron mobility

**Q.7** Describe the limitations of conventional tubes. Hence explain construction and working of microwave BJTs.

**Q.8(a)** Explain practical applications and characteristics of microwave FETs.

(b) Briefly explain negative resistance parametric amplifier. Also write its applications.

**Q.9(a)** With neat diagrams, write a short note on varactor diode and step recovery diode with applications.

(b) What is the importance of PIN diodes at microwave frequencies? Describe the behavior of PIN diode mounted in a transmission line.

**Q.10** A TRAPATT diode has doping concentration, $N_A=2*10^{15}cm^{-3}$; current density, J= $20KA/cm^2$. Calculate the avalanche-zone velocity.

## UNIT-3

**Q.1** List the basic characteristics required for an ideal substrate and conductor material.

**Q.2** List the basic properties provided by ideal conductor, dielectric, and resistive materials used in MMICs.

**Q.3** Describe in detail, the MMIC fabrication techniques. Hence explain the photoresist process.

**Q.4** Describe the basic fabrication processes for MOSFETs.

**Q.5** A planar resistor has the following parameters:

Resistive film thickness, t= 0.1μm; resistive film length, l=10mm; resistive film width, w=10mm; sheet resistivity of gold film, $\rho_s=2.44*10^{-8}\Omega$-m. Calculate the planar resistance.

**Q.6** Discuss the capacitor-film development and inductor-film formation.

**Q.7** Describe the memory construction. Briefly explain DRAM cell with double-level polysilicon layer.

**Q.8** Explain plate-through technique for fabricating the hybrid integrated circuits.

**Q.9** (a) Discuss the discrete, integrated and monolithic microwave integrated circuits.

(b) Differentiate between hybrid ICs and miniature hybrid ICs.

**Q.10(a)** A circular spiral inductor has the following parameters: no. of turns, n=5; separation, s= 100mils; film width, w=50mils. Compute the inductance.

(b) An interdigitated capacitor fabricated on a GaAs substrate has: No. of fingers, N=8; $€_r$=13.10; substrate height, h=0.254cm; finger length, l=0.00254cm; finger-base width, w=0.051cm. Compute the capacitance.

## UNIT-4

Q.1(a) Describe the single stub and double stub tuners used in microwave engineering.

(b) Explain the PCB design criteria for microwave circuits.

Q.2 Consider a lossless two port network, if the network is reciprocal show that

$$|S_{21}|^2 = 1 - |S_{11}|^2$$

Q.3 Describe the conversion of S- parameters in terms of ABCD parameters and vice-versa.

Q.4 (a) Write short note on microwave filters.

(b) Explain the characteristics of the Smith chart and how it is useful to solve the transmission line parameters.

Q.5 Derive the transient transmission line analysis of a microwave network.

Q.6(a) Explain the role of microwave filters in microwave engineering.

(b) Explain the behavior of wire, resistor, capacitor and inductor at high frequencies.

Q.7 Compare the practical advantages and disadvantages of the hybrid junction with those of the hybrid rings. Explain the operation and applications of hybrid rings.

Q.8 A lossless line having $Z_o=50\Omega$ is to be matched to a load $Z_l=50/[2+j(2+\sqrt{3})]\Omega$ by means of a lossless short-circuited stub. The characteristic impedance of the stub is 100Ω. Find the stub position closest to the load and length so that a match is obtained.

Q.9 Prove that it is impossible to construct a perfectly matched, lossless, reciprocal 3-port junction.

Q.10 Derive the condition for (i) lossless network (ii) reciprocal network.

## UNIT-5

Q.1 Explain with diagrams, branch line and parallel coupled directional couplers. Hence describe its directivity and coupling factor.

Q.2 Derive the condition of oscillation and amplification for Gunn diode, hence explain Gunn diode as an oscillator.

Q.3 Explain power dividers and microstrip phase shifters. Describe the condition for phase shifters.

Q.4 Explain the importance of negative resistance. Derive the condition for negative differential resistance of transferred electron devices.

Q.5 Describe the operation of mixer diodes. Hence explain single-ended and balanced diode mixers.

Q.6 With neat diagrams, explain PIN diodes as (i) SPDT and DPDT switches (ii) phase shifters.

Q.7 If $b_1$=2cm, $b_2$=1cm and a=4cm for lossless, air-filled waveguide, calculate (a) SWR along the $Z_{01}$line at 6GHz if $Z_{02}$ line is terminated by a matched load (b) A matched 6GHz generator ($Z_G$=$G_{01}$) having an available power 1W, is connected to the $Z_{01}$line. How much power is delivered to the matched load terminating the $Z_{02}$ line?

Q.8 With the help of S-matrix, explain 3-db power divider and show that

$|S_{22}| = |S_{23}| = |S_{33}| = ½$

Q.9 Explain the different classes of microwave amplifiers and there dynamic range.

Q.10 Explain the working of low-noise amplifiers (LNA). List the various advantages and limitations of LNA.

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

## Subject: Antenna and Wave Propagation (EC602)

**UNIT- I**

**Q 1.** Give a physical significance of antenna in a communication. Explain how the antenna length is an important factor for the antennas.

**Q 2.** Define the term Antenna briefly. Explain the concept of Radiation in antenna.

**Q 3.** Define the term Dipole. Explain the current distribution of Half Wave Dipole.

**Q4.** Explain the current distribution on a thin wire antenna using suitable diagrams.

**Q 5.** Explain the various terms associated with radiation pattern. Give a significance of front to back ratio.

**Q 6.** Explain the radiation mechanism in single wire using appropriate diagram showing the electric field. Also explain the different configuration of single wire

for radiation.

**Q 7.** What do you mean by radiation pattern. Explain the different types of lobes in the radiation pattern of an antenna using appropriate diagram showing the different lobes.

**Q 8.** What are the function of an antenna? Explain the mechanism of radiation in two wires?

**Q.9** Explain the field produced by an oscillating current element in radiation and near zone.How do we differentiate between the near field and far field of the antenna?

**Q.10** What do you mean by radiation pattern of an antenna? What are its different types? Find the expression for E and H of a short dipole.

**UNIT-II**

**Q 1.** Explain the following terms regarding Antenna.
(i)Directive Gain (ii)Antenna Efficiency (iii)Antenna Impedance
(iv)Antenna temperature

**Q 2.** (a)Derive the relationship between directivity and maximum effective aperture of an antenna.
(b)Find out the field strength at 30km away from a transmitting antenna of 625kW power.

**Q 3.** Explain the following terms in detail :

(i)Radiation Resistance (ii) Effective area (iii) Antenna Gain (iv) Polarization

**Q4.** (a)A thin dipole antenna is $\lambda/15$ long. If it's loss resistance is $1.5\Omega$. Find the radiation resistance and the efficiency.
(b)Calculate the strength of electric field at a distance of 100km due to a power of 100kW radiated from an antenna of 100 meters effective height, if the wavelength is 5000 and absorption effects are negligible.

**Q 5.** (a)What is the radiation resistance of an antenna? How is it related to the impedance of the antenna?
(b)Calculate the radiation resistance of a current element whose overall length is $\lambda/50$.

**Q6.** Write a short note on Radiation pattern and explain the term half power beam width and Beam width between first null using appropriate figures.

**Q 7.** (a)Explain the radiation density and radiation intensity in detail.
(b) Derive the relationship between gain and effective area of an antenna.

**Q 8.** (a)Define the directive gain and power gain of an antenna. Show the relationship between them.
(b)An antenna having a radiation resistance of 75Ω is radiating 10kW. How much current flows into the antenna?

**Q 9.** Explain the various antenna losses and Derive the relationship between antenna efficiency and radiation resistance.

**Q 10.** (a) Explain the following terms:
(i)Isotropic antenna (ii)Antenna Bandwidth (iii) Power Gain
(b)The noise figure of an antenna amplifier at room temperature (T = 290˚k) is 0.2 db. Find the equivalent temperature.

**UNIT-III**

**Q 1.** What is an antenna arrays? What are the reasons for using antenna arrays? Explain in detail the behavior of broad side and end fire arrays.

**Q 2.** (a)A linear broadside array consists of 4 equal isotropic in phase point sources with **λ/3** spacing (overall length = **λ**). Calculate the directivity and beam width.
(b)Find the FNBW for a broad side linear array consisting of 20 Hertzian dipole with λ/2 separation.

**Q 3.** Describe a Broadside array. Deduce an expression for the radiation pattern of a broadside array with n vertical dipoles. Sketch the radiation pattern, in vertical and horizontal planes for such an array with four dipoles.

**Q4.** (a)Calculate the directivity of a linear end-fire uniform array of 10 elements with a separation of **λ/4** between the elements.
(b)Find the directivity of linear, end fire Hansen wood yard, uniform array of 10 element with a separation of λ/4 between the elements.

**Q 5.** What is End fire array? Deduce an expression for the radiation pattern of a end fire array with n vertical dipoles. Sketch the radiation pattern, in vertical and horizontal planes for such an array with six dipoles.

**Q6.** Discuss the advantages of using the Dolph-Chebyshev distribution for a broadside linear array with equal spacing between elements.

**Q 7.** What are broadside and end fire arrays? Derive the expression for the array factor of linear broadside array of n elements.

**Q 8.** Design a four element broadside array of λ/2 spacing between elements. The pattern is to be optimum with a side lobe level 19.1dB down the main lobe maximum.

**Q 9.** Explain briefly scanning and super-directive array.

**Q 10.** Write a short note on Hansen-wood yard end fire array.

**UNIT-IV**

**Q 1.** What are electromagnetic horn antennas? What are the various types of horns? Explain.

**Q 2.** (a)Explain the Slot antenna briefly.
(b) A parabolic antenna having a circular mouth is to have power gain of 1000 at λ=10

cm. Estimate the diameter of the mouth and the half power beam width of the antenna.

**Q 3.** (a)Explain briefly the Babinet's Principle.

(b) Find the terminal impedance of an infinitesimal thin $\frac{\lambda}{2}$ slot antenna, when the impedance of infinitesimal thin $\frac{\lambda}{2}$ dipole antenna is 73 + j 42.5 ohms.

**Q4.** Explain the rectangular and circular aperture antenna in detail with example.

**Q 5.** (a)Explain briefly the paraboloidal reflector antenna.
(b)Estimate the diameter of a paraboloidal reflector antenna required to produce null beam width of $10^o$ at 3GHz.

**Q6.** (a)Find out the beam width between first nulls and power gain of a 2-m parabolidal reflector operating at 6000 Mhz.
(b)Calculate the power gain of an optimum horn antenna approximately with a square aperture of 10λ on a side.

**Q 7.** (a) Explain the field equivalence principle.
(b)Calculate the diameter of a paraboloidal reflector required to produce a beam of $15^o$ width at 1.5 GHz.

**Q 8.** Find the terminal resistance of complementary slot for a cylindrical dipole with length of diameter ratio of 28 and length of 0.925 λ having terminal impedance of 710 + j0.

**Q 9.** (a)Determine the gain, beam width and capture area for a parabolical antenna width 10 m diameter dish and dipole feed at 10 GHz.
(b)Estimate the diameter of a paraboloidal reflector required to produce a beam of $5^o$ width at 1.2 GHz.

**Q 10.** (a)A parabolic dish provides a gain of 75 db at a frequency of 15 GHz. Calculate the capture area of the antenna and beam width between first null.
(b)A parabolic antenna is operating at 8GHz and has first nulls beamwidth of 6 degree. Calculate half power beamwidth.

**UNIT-V**

**Q 1.** (a)Explain the concept of critical frequency. If critical frequency is $f_c$ and $N_{max}$ is the maximum ionic density than show that

$$f_C = 9\sqrt{N_{\max}}$$

(b)A pulse of given frequency transmitted upward is received back after a period of 5 milli seconds. Find the virtual height of the reflected layer.

**Q 2.** (a)Explain sky wave propagation.
(b)A television transmitter antenna has a height of 169 meters and the receiving antenna has a height of 16 meters. What is the maximum distance through which the TV signal could be received by space wave propagation?

**Q 3.** (a)What is space wave propagation? Explain it briefly.
(b)Find the range of LOS system when the receiving and transmitting antenna heights are 10m and 100m respectively. Take the effective earth radius into consideration.

**Q4.** Explain the formation of Ionosphere. What are the various layers of the ionosphere? With the neat diagram show their respectively electron densities and height above the ground.

**Q 5.** (a)Discuss the frequency bands useful for duct propagation. What are main limitations?
(b)What is the critical frequency for reflection at vertical incidence if the maximum value of electron density is $1.24\times10^{6}$ $cm^{-3}$.

**Q6.** Show that the refractive index of the ionosphere ,in absence of magnetic field and collisions is given by

$$\mu = \sqrt{1-\left(\frac{81N}{f^2}\right)}$$

**Q 7.** (a)Explain the troposcatter mode of wave propagation with the help of diagram. What are its advantages?

(b)Discuss the frequency bands useful for duct propagation. What are the main limitations?

**Q 8.** Discuss the concept of MUF in ionosphere propagation. Derive the expression for it.

**Q 9.** (a)Describe some important difference between ground wave and space wave propagation.
(b)Calculate the value of frequency at which an electromagnetic wave must be propagating through D-region with an index of refraction of 0.5 and an electron density $3.25\times10^{4}$ electron/ $m^{3}$.

**Q 10.** (a)Derive fundamental equation for free space propagation.

(b)Define the terms virtual height, maximum usable frequency and skip distance

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

## Subject: WIRELESS COMMUNICATION (EC603)

### UNIT 1:

1.Explain long-term and short term fading with the help of figure with relation to mobile telephony.

2. Explain and discuss different types of fading multipath channels in wireless communications.

3. What do you mean by fading channel. Write short notes on and their characteristics.

4. Describe following in wireless communication:

(i) Flat fading & freq selective fading.

(ii) Rayleigh and rician fading channel.

5. (a)Explain the digital signaling over a frequency non selective slowly fading channel.
(b) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 Mhz. for a vehicle moving at 60 mph. Compute the received carrier frequency if the mobile is moving.

(i) Directly towards the transmitter.

(ii)Directly away from the transmitter.

6. (a) Explain the concept of frequency selective slowly fading channel.
(b). Give a brief note about CDMA used in Wireless Communication.

7. Explain the concept, application and applicability of Spread Spectrum signals.

8. Explain Direct Sequence Spread Spectrum (DSSS) System and derive the processing gain of DSSS.

9. What is PN sequence ? Describe and explain the characteristics and generation of p – n sequence.

10. Using suitable diagram, explain frequency hopping spread spectrum technique. Differentiate between FHSS and DSSS.

## UNIT 2:

1. (a) Explain the concepts of Frequency Division Multiple Access.
(b). A DSSS has a 1.2288Mcps clock code rate and a 9.6 kbps information rate. Calculate the processing gain. How much improvement in information rateis achieved if the code generation gate is changed to 5 Mcps and the processing gain to 256.

2. Explain the following term of CDMA digital cellular system.
   (i) Active set
   (ii) Long Code
   (iii) Multiple sublayer
   (iv). Pagging Channel.

3. (a) Explain the differences between the synchronous TDMA and statistical TDMA.
(b) What is rake receiver?

4. What is the difference between multiplexing and multiple access techniques? How does a CDMA receiver select the signal meant for it and reject others.
5. With suitable example show the working of a CDMA based networks.

6. Define and compare FDMA, TDMA and CDMA.

7. What do you mean by Space Division Multiple Access? What are their applications and where are they employed?

8. (a) Write a note on Packet Radio Protocols?
   (b) In an pure ALOHA system the packet arrival times form a Poisson distribution having a rate of 103 packets/sec. If the bit rate is 10 Mbps and there are 10,000 bits/packet, find

   (i) Normalized throughput of the system

(ii) Number of bits per packet that will maximize the throughput.

9. Explain the pure ALOHA and Slotted ALOHA Cellular Systems and Show that slotted ALOHA has a maximum throughput of twice the maximum throughput of pure ALOHA:

10. What is Throughput? Compare the throughput of pure ALOHA and slotted ALOHA.

**UNIT 3:**

1. Explain the basic concepts of Cellular Wireless Networks with reference to shape of the cell and frequency reuse.

2(a). Explain the various generations and examples of each generation of Cellular Wireless Networks.

(b). Write short notes on

(i). Blue tooth.

(ii). Wi-Fi Technology.

3 Explain the architecture of GSM with suitable Diagram.

4. Explain the concept of GSM superframe, multiframe and time slot in GSM. Give suitable illustration of GSM frame hierarchy.

5.(a) What are the various Cordless systems? What is the need for standardization?

(b). Explain IEEE802.16 protocol architecture and services.

6. .(a) What are the advantages of digital cellular system over analog?

(b) Explain the difference between the DECT and PWT.

7. (a). Explain the DECT frame format and protocol architecture of the same.

(b) Explain the architecture of IEEE 802.11 WLAN.

8. How is WLL different from other systems like cellular and cordless systems? Give the applications of WLL.

9. (a). Explain the Mobile IP with the help of a block diagram.

(b). What is Wireless access protocol? Explain briefly.

10. Compare the salient features , advantages of WLAN's and wired LAN technology.

## UNIT 4

1. Explain the difference between wireless and fixed telephone networks.

2.What do you mean by traffic Routing in wireless networks. Compare circuit switching and packet switching.

3.Explain common channel signaling in detail.

4.Write short note on

(i) Advanced radio data information system.
(ii) RAM mobile data.

5. Compare the first second and third generation wireless networks.

6. What is ISDN? Explain it and draw the block diagram and brief the benefits for ISDN.

7. Write short note on broadband ISDN and ATM.

8. Explain the signaling system no. 7 protocol architecture.

9. (a) What is Internet? Give various networks for connecting to the Internet.
(b). Describe the various features of X.25 protocol.

10. What are the different services offered by SS-7 networks. Explain briefly

## UNIT 5:

1. What are the different elements of satellite communication ?Explain briefly.

2. Explain the frequency bands used in satellite communication.

3. (a). Briefly explain Satellite link design.
(b). Drive the expression of noise figure in satellite communication.
4. (a). What are Kepler's three laws of planetary motion? Explain orbital period, orbital velocity.
(b). Explain the terms

Elevation angle
Coverage angle

5. (a). Derive the expression for the height of the geostationary orbit.
(b). Explain FDM and TDM multiplexing techniques used in satellite communication.

6. Write short notes on

(i)High power amplifier
(ii)Low noise amplifier
(iii)Up converter
(iv)Down converter

7 (a) What is orbital period ? Derive the expression for the velocity.
(b). Explain the effects of orbital inclination.

8 (a). Explain the Frequency division multiple access technique in satellite communication.

(b). A satellite in GEO orbit is at a distance of 39000 km from a earth station. The required flux densityat the satellite to saturate one transponderat a frequency of 14.3 Ghz is -90 dBW/$m^2$.The earth station has a transmitting antenna with a gain of 52 dB at 14.3 Ghz. Find:

(i) The EIRP of the earth station.

(ii) The output power of the earth station transmitter.

9 (a). Using a neat block diagram explain how a satellite is tracked in its location using TT and C system.

(b) A satellite at a distance of 38000 km from a point on earth's surface radiates a power of 2 W
From an antenna with a gain of 17 db in the direction of observer. Find the flux density at the receiving point and the power received by the antenna with an effective area of 10 $m^2$.

10. Write short notes on
(i). LNA
(ii). AOCS
(iii). Gravitaional nodes
(iv). Reliability

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

## Subject: IC Technology (EC604)

### UNIT-I

Q.1 Explain the various advantages of IC's.
Q.2 Explain the basic steps for fabrication of IC's.
Q.3 Explain the monolithic IC's with suitable diagram.
Q.4 Classify the IC's according to their uses.
Q.5 Explain the hybrid or multichip IC.
Q.6 Explain the difference between digital IC and linear IC.
Q.7 Explain the different digital IC with suitable example.
Q.8 Explain the different linear IC with suitable example.
Q.9 Explain the various disadvantages of IC's.
Q.10 Explain the various advantages and disadvantages of IC's.

### UNIT-II

Q.1What is czochralski growth? Give the difference between pull rate and growthrate. Can the pull rate become negative? If yes, explain why?

Q.2 Explain the Horizontal bridgeman method.

Q.3In a CZ growth, if the density of solid silicon is 2.2x10-3 gm/cm3, thermalconductivity of solid is 7.7x10-4mho and the thermal gradient at interface is0.5, then find out maximum pull rate. Assume the latent heat of fusion to be1.4J.

Q.4 Explain the Zone refining and discuss the salient features of substrate slicingand polishing.

Q.5In a four point probe technique if a current of 6mA is passed through outer probes and voltage of 12mV is measured between inner probes,then find the resistivity of crystal by assuming the probe spacing to be 4cm.

Q.6Explain the silicon Float Zone process.

Q.7 Explain the Vapour phase Epitaxy(VPE).

Q.8 Explain the molecular beam epitaxy(MBE).

Q.9 Explain the Electronic Grade Silicon(EGS) process.

Q.10Explain the different kinds of crystal defects.

Q.11 Find the concentration of boron in crystal at a fraction solidified of 0.5.if Cs at X=0.04 is $2*10^{18}$ and segregation coefficient is 0.8.

Q.12 Explain the Electronics Grade Silicon process in detail.

Q.13 Explain the Wafer preparation process in brief.

Q.14 If in a silicon crystal the concentration of impurity is $1.8*10^{-8}$ per $cm^3$, then find the stress for line dislocation. Assume the young modulus 100, poission ratio 0.6 and lattice contraction constant unity.

## UNIT-III

Q.1 Explain the Range theory for the Ion implantation method.

Q. 2 Explain the deal-grove method of oxidation.

Q.3 Explain the various oxidation techniques.

Q.4 Explain the various oxidation properties.

Q.5 Explain the contact and proximity printing.

Q.6 What is etching process and also explain the Wet and Dry etching.

Q.7 Explain the Reactive ion etching.

Q.8 Explain the effect of impurities and damage on the oxidation rate.

Q.9 Prove that the results obtained for the dry oxidation at 1100 C by using generalformula of thickness , do resembles with the result obtained by using formulaof thickness for long and short times. Take the value of A and B to be 0.09μm and 0.027μm2/h, τ=0.076h.

Q.10 Whypreoxidation cleaning is necessary before oxidation? What are thedifferent kinds of oxidation techniques?

Q.11 What are effects of impurities on oxidation rate?

Q.12 Explain positive and negative photoresist. Why positive photoresist gives higher resolution.

Q.13 Explain different reactive plasma etching techniques.

Q.14 What is lithography? Explain the basic steps for photolithography.

Q.15 Determine the times required in growing an oxide layer of thickness 0.06μm. Assume the wet oxidation method has been used for oxide growth, and the temperature to be $1100^0$C. A=0.11μm,B=0.510$\mu m^2$/h,τ=0.

Q.16 If aluminum is being evaporated at $1150^0$K in a $25cm^2$ cell, then find out the atomic flux at a distance of 0.5m, assume that the wafer is directly above the surface. Also find out the growth rate. Assume vapour pressure at $1150^0$C to be $10^{-6}$torr.

## UNIT-IV

Q.1 Develop Fick's laws of diffusion. Write their solution for constant surface concentration and total dopant for constant diffusivities with their boundary conditions

Q.2 Explain the Extrinsic diffusion and Lateral diffusion.

Q.3How long could it take for a fixed amount of phosphorus distributed over surface of 25µm thick silicon wafer to become sybstantially uniform distributed throughout wafer at 13000 C. consider that concentration is sufficiently uniform if does not differ more than 10% from at surface. D=2.5*10-12cm2/sec

Q.4Explain the various isolation techniques.

Q.5Explain the implant damage and annealing process.

Q.6Explain the VI IC packaging technique.

Q.7Prove the utility of implantation for shallow junction.

Q.8 Compare the ion implantation and diffusion. Show how the ion implantationis done? What do you understand by range and straggle of implant ion?

Q.9What are the various approaches of diffusion?

Q.10Explain the wire bonding technique.

Q.11 Determine the diffusivity from a known impurity profile. Assume that boronis diffused into an n-type silicon substrate with a doping concentration of $10^{15}$atoms/$cm^3$ and also that the diffusion profile can be described byGaussian function. For the diffusion time 60 minutes, a junction depth of 2µm and surface concentration of $1x10^{18}cm^{-3}$ is obtained. Also find the total concentration of dopant in diffused layer.

.Q.12What is annealing? Explain different annealing process.

Q.13What is diffusion? Explain the Fick's diffusion equation in one dimension.

Q.14Explain the Ion implantation process and need of annealing .

Q.15Explain the Range theory for the ion implantation process.

Q.16 An n+ diffusion is performed into a p-type silicon having a uniform dopant concentration of $5*10^{23}$ atoms/m3. If the dopant concentration in the gas above the wafer surface is maintained constant$5*10^{26}$ atoms/$m^3$ and process time is 30 minutes, calculate

the depth of n-type diffusion. The diffusion coefficient is $5*10^{-17}m^2$/sec and refc(2.3)=$10^{-3}$.

## UNIT-V

Q.1 Explain the CMOS fabrication technique for n-well process sequence.

Q.2 Explain the CMOS fabrication technique for p-well process sequence.

Q.3 What do you understand by Bipolar IC technology? Give a comparisonbetween Bipolar and CMOS technology.

Q.4 What are the basic fundamental consideration for IC processing?

Q.5 What are the special consideration for developing NMOS IC technology?

Q.6 What do you understand by minimum feature size and nesting tolerance in theminimization of VLSI circuit? Explain.

Q.7 Explain the fabrication of resistor and capacitor.

Q8 Explain the bulk micromachining process flow in detail.

Q.9 Explain the MEMS actuators with suitable diagram.

Q.10 Explain the mechanics of common MEMS device in detail.

Q.11 Write short note on MEMS.

Q.12 Give reasons why resistors cannot be fabricated on IC.

## Question Bank for B.Tech. VI Sem. End-Term Examination, 2014
# Subject- Synthesis and Optimization of Logic Circuits (EC605)

## Unit - I

Q1. (a) State and explain Moore's Law and ASIC in brief.

(b) Explain the classification of Chip integration in brief.

Q2. Describe briefly four phases in creating microelectronic chips.

Q3. Compare the different microelectronics design styles.

Q4. What is full custom and semi custom design styles, Explain the cell-based and array-based design style.

Q5.What is synthesis? Explain the different synthesis of circuit model.

Q6. What is optimization? Explain types of optimization of any circuit.

Q7. Explain synthesis with the help of gajski & kuhns Y-chart.

Q8. Explain different levels of abstraction and corresponding views, also express the relation between them.

Q9. Write short note on following- (i) ASIC (ii) IC Package (iii) Computer aided design

## Unit – II

Q1. (a) What is behavioral optimization technique? Differentiate data flow and control flow oriented optimization.

(b) Explain front end and back end model of compiler.

Q2. Explain Dataflow and Sequencing graph with the help of an example.

Q3. What is state diagram? Explain the different element of state diagram.

Q4. What is compiler? What are basic functions of compiler?

Q5. How a compiler works? Explain analysis and synthesis part of compilation process.

Q6. Explain Spatial domain Binding with an example on sequencing graph. Also write the binding function for the sequencing graph for non dedicated resources.

Q7. Explain Temporal domain Scheduling .When only one resource of each type (multiplier & ALU) is available. Schedule any sequencing graph.

Q8. (a) Explain Area and performance estimation for resource dominated and general

circuits.

(b) Explain state diagram with example. Differentiate mealy and moore models.

Q9. A set of computation for a sequencing graph is

$xl = x + dx;$

$ul = u - (3 * x * u * dx) - (3 * y * dx);$

$yl = y + u * dx;$

$c = xl < a;$

Draw & Schedule the sequencing graph with temporal domain scheduling and bind the resources with unconstraint spatial domain binding. Also find the latency of sequencing graph?

Q10. A set of computation for a sequencing graph is

$xl = x + dx;$

$ul = u - (3 * x * u * dx) - (3 * y * dx);$

$yl = y + u * dx;$

$c = xl < a;$

Where the propagation delay of multiplication is 35 nsec and that of the other operation is 25 nsec. Assume a 50 nsec cycle time. Draw & Schedule the sequencing graph with temporal domain scheduling. Calculate the latency of graph.

## Unit – III

Q1. Write down the ASAP scheduling algorithm. Explain the ASAP scheduling with example.

Q2. Explain latency constrained ALAP Scheduling algorithm using one example.

Q3. Explain Integer Linear Programming model for scheduling with resource constraints.

Q4. (a) Explain Multiprocessor Scheduling algorithm using one example.

(b) Define the relative timing constraints graph and define these maximum and minimum relative timing constraints in it.

Q5. Write short note on Force Directed Scheduling.

Q6. Explain following List Scheduling algorithm using one example.

(i) Minimum latency resource constrained scheduling problem

(ii) Minimum resource latency constrained scheduling problem

Q7. For the given sequencing graph G(V,E) . Find the number of resources require to it schedule in 4 time steps. Assume that all operations have unit execution delay.

G(V,E)= $xl = x + dx;\ ul = u - (3 * x * u * dx) - (3 * y * dx);\ yl = y + u * dx;\ c = xl < a;$

Q8. A set of computation for a sequencing graph is

$xl = x + dx;$

$ul = u - (3 * x * u * dx) - (3 * y * dx);$

$yl = y + u * dx;$

$c = xl < a;$

Schedule the graph with ASAP scheduling algorithm.

Q9. A set of computation for a sequencing graph is

$xl = x + dx;$

$ul = u - (3 * x * u * dx) - (3 * y * dx);$

$yl = y + u * dx;$

$c = xl < a;$

Schedule the graph with ALAP scheduling algorithm.

Q10. Write short notes on following in term of sequencing graph

a) Mobility b) latency c) Scheduling d) source and sink node

## Unit – IV

Q1. For the given function f = ab + bc + ac . Find its cofactor w.r.t. a and a' and also find consensus and smoothing w.r.t. a.

Q2. Define the following terms.(i) Multiple output implicant (ii) Multiple output minterm (iii) Cover (iv) Minimum cover (v) Prime implicant

Q3. For the given three input ,two output function f=($f_1$,$f_2$) where $f_1$ = a' b' c' + a' b'c + ab'c + abc + abc' , $f_2$ = a' b' c' + ab'c .Find (i) Minimum Cover (ii) Irredundant Cover (iii) Redundant Cover

Q4. Explain Heuristic logic minimization and various operators Expand, Reduce, Reshape and Irredundant used in it.

Q5. Describe Positional Cube Notation in brief. Consider the function f = a'd' + a'b + ab' + ac'd ,write its corresponding implicant table in the positional cube notation.

Q6. What is heuristic logic minimization? Explain any two operators in this minimization.

Q7. Explain positional cube mutation for binary and multi valued functions. Assuming x is binary valued and y is ternary valued variables, write positional cube notation for $x^{(`1)}$ for the following function:

$$f = x^{(1)} \cdot y^{(0,1)} + x^{(0,1)} \cdot y^{(2)}$$

Q8. Consider the function f = (a+b) (b+c) (a+c). Find out the Boolean derivative, consensus and smoothing with respect to variable a.

Q9. State and explain the principles of logic optimization. Consider a multiple output function.

$$f_1 = ab' + bc$$
$$f_2 = a' c' + abc$$
$$f_2 = a' b' + abc$$

Draw its PLA implementation and cube table.

Q10. a) What is List Oriented Manipulation? Explain properties and pair wise operations between implicants.

b) Explain Quine and McCluskey algorithm with example.

## Unit –V

Q1. Design a sequence detector that produces an output '1' whenever the non overlapping sequence 1011 is detected.

Q2. Explain Sequential circuit optimization using state based models.

Q3. Explain state encoding for two level circuits.

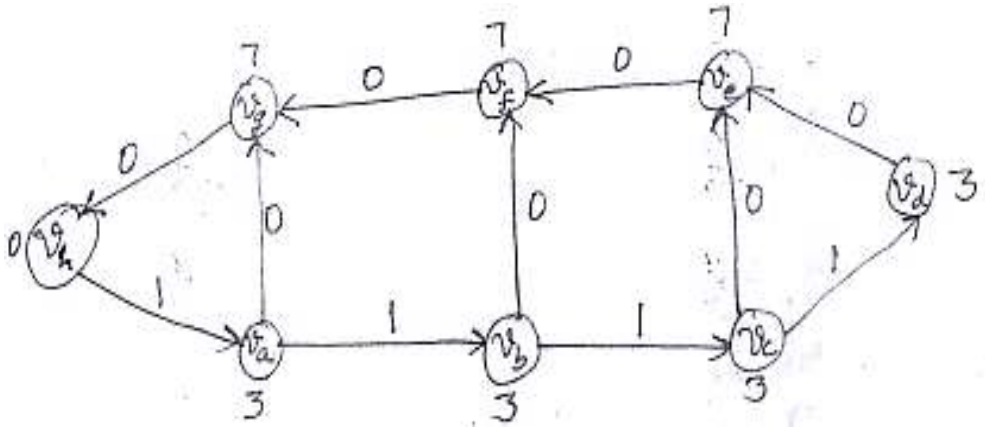
Q4. What is retiming ? Discuss the various advantages of retiming.

Q5. Discuss Sequential circuit optimization using Network models.

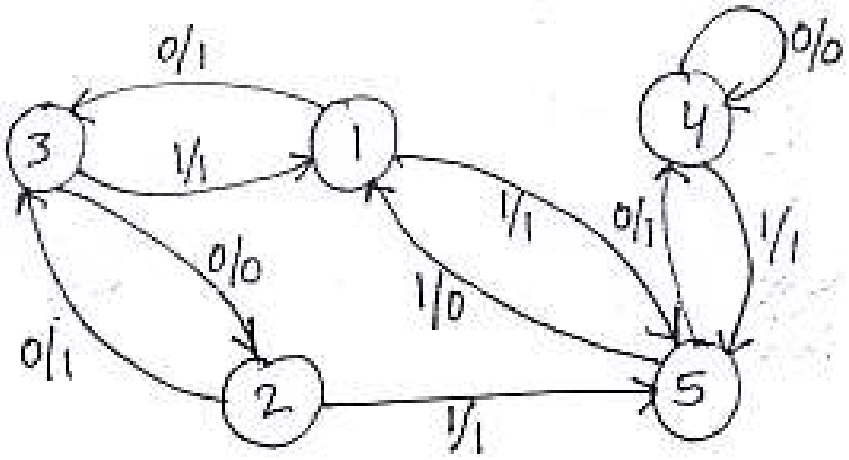
Q6. Draw and explain sequential circuit model with an example.

Q7. Explain problems in asynchronous circuits.

Q8. Consider the network given below. Draw the weighted graph modeling the search for a legal retiming with cycle time of 22 units using the Bell man – Ford method. Compute the retiming and draw the retimed network graph.



Q9. Find the minimum – state diagram of state – diagram shown in fig. given below by using state minimization method (partitioning)




Q10. Consider the state table given below. Derive a minimum state diagram.

| Input | State | Next State | Output |
|---|---|---|---|
| 0 | A | E | 0 |
| 1 | A | D | 1 |
| 0 | B | F | 0 |
| 1 | B | D | 0 |
| 0 | C | E | 0 |
| 1 | C | B | 1 |

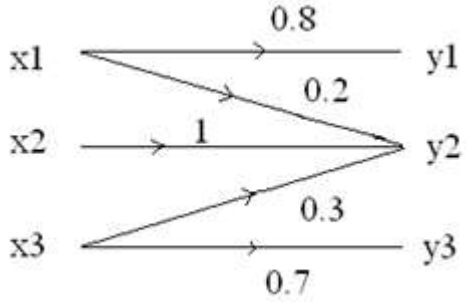
| | | | |
|---|---|---|---|
| 0 | D | F | 0 |
| 1 | D | B | 0 |
| 0 | E | C | 0 |
| 1 | E | F | 1 |
| 0 | F | B | 0 |
| 1 | F | C | 0 |

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

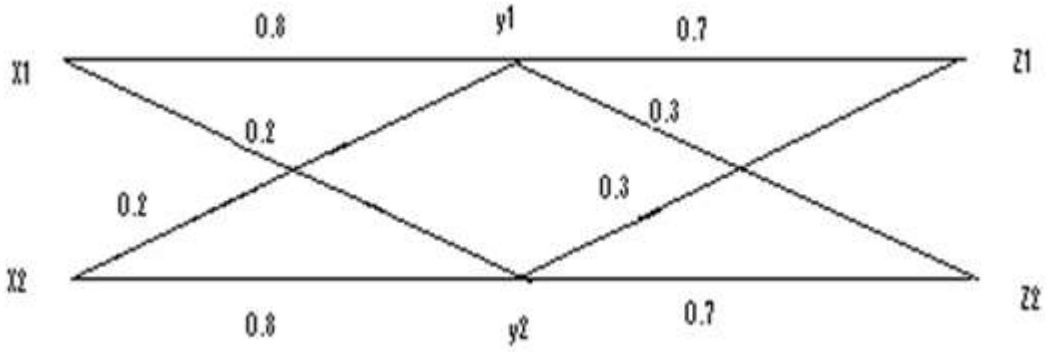
## Subject: Information Theory and coding (EC606)

### UNIT-I

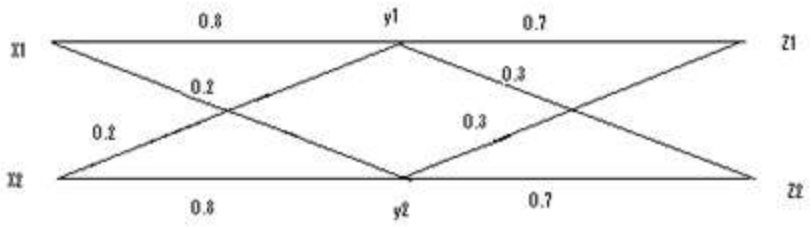
Q.1 (a)What do you understand about the information? How it is measured?
(b) Define Entropy. Under what condition, is maximum entropy achieved? Obtain the value of maximum entropy for a binary system.
Q.2 A source emits one of five symbols x1, x2, x3, x4 and x5 with probabilities 1/2, 1/4, 1/8, 1/16, and 1/16 respectively. The successive symbols emitted by the source are statistically independent. Calculate entropy of the source.
Q.3 (a) What is entropy? Prove that:
$H(X, Y) = H(X/Y) + H(Y) = H(Y/X) + H(X)$
(b) Find the channel matrix P(Y/X) and joint entropy H(X, Y) if P(X) = {0.3, 0.4, 0.3}




Q.4 An event has six possible outcomes with the probabilities p1=1/2, p2=1/4, p3=1/8, p4=1/16, p5=1/16. Find the rate of information if there are 16 outcomes per second.
Q.5 Two BSCs are connected in cascade, as shown in figure below.




(i) Find the channel matrix of the resultant channel.
(ii) Find P(z1) and P(z2) if P(x1) = 0.7 and P(x2) = 0.3
Q.6 Given the binary symmetric channel as shown below: Find the-




(i) Overall channel matrix.
(ii) Calculate the p(z1) and p(z2) when p(x1)=.6 and p(x2)=.4.
(iii)Calculate the joint probabilities p(x1,y1), p(x1,y2), p(x2,y1) and p(x2,y2) when p(x1)=.6 and p(x2)=.4.

Q.7 A high resolution Black & White TV picture consist of $2*10^6$ picture elements and 16 brightness levels. Pictures are repeated at 32 pictures/second. All picture elements are assumed to be independent and all levels have equal probability of occurrence. Calculate average rate of information produces by TV picture source?

Q.8 A transmitter has an alphabet of four letters [$x_1$, $x_2$, $x_3$, $x_4$] and the receiver has an alphabet of three letters [ $y_1$, $y_2$, $y_3$]. The joint probability matrix is

$$P(X, Y) = \begin{array}{c|ccc} & y1 & y2 & y3 \\ x1 & 0.3 & 0.05 & 0 \\ x2 & 0 & 0.25 & 0 \\ x3 & 0 & 0.15 & 0.05 \\ x4 & 0 & 0.05 & 0.15 \end{array}$$

Calculate all the entropies.
Q.9 Define the following and list their important properties:
(i) Information
(ii) Entropy

.

Q.10 Explain briefly discrete memoryless channels.
Q.11 Write short note on continuous channel.

## UNIT-II

Q.1 (a) Give the statement of Shannon Hartley Theorem and explain it.
(b) For Gaussian channel bandwidth is 5k Hz and a message is being transmitted with R = 106 bits/sec., find S/N for R < = C
(c) What do you understand by bandwidth S/N trade-off.
Q.2 (a) Derive an expression to define channel capacity of Gaussian channel.
(b) A Gaussian channel has 1M Hz bandwidth. Calculate the channel capacity if the signal power to noise spectrum density ratio (S/ή) is 105 Hz. Also find the maximum information rate. [ N = ήB ]

Q.3 (a) Explain the types of errors that occur during data transmission and the methods suitable to minimize each of them.
(b) For controlling the error, the parity check bits are appended (channel coding) so is it extra overhead? Justify your answer.
Q.4 A Discrete Memoryless Source X has five symbols x1, x2, x3, x4, and x5 with P(x1) = 0.4, P(x2) = 0.19, P(x3) = 0.16, P(x4) = 0.15, and P(x5) = 0.1
(a) Construct a Huffman code for X
(b) Calculate the efficiency of the code.
Q.5 Find the code word length, code word efficiency and code redundancywith the help of Shannon –Fano coding. Where
p(x1) =.20, p(x2) =.20, p(x3) =.15 p(x4) =.15,
p(x5) =.10, p(x6) =.09, p(x7) =.06 p(x8)=.05
Q.6 Find the code word length, code word efficiency and code redundancy with the help of Shannon –Fano coding.(using ternary and Quaternary ) Where
p(x1) =.25, p(x2) =.20, p(x3) =.15 p(x4) =.15, p(x5) =.15, p(x6) =.05, p(x7) =.05
Q.7 An Analog signal has a 4KHz bandwidth. The signal is sampled at 2.5 times the Nyquist rate and each sample is quantized into one of 256 equally likely levels. Assume that successive sample are statistically independent.

1. What is the information rate of this source?
2. Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10k Hz and S/N ratio is 20 dB?
3. if answer NO for part 2, then find S/N ratio required for error free transmission for B=10k Hz.

Q.8 Calculate the capacity of a Gaussian channel with a bandwidth B = 1MHz and S/N ratio is 30dB.
Q.9 A Television transmission requires 30 frames of 300,000 pictures elements each to be transmmited per second. Estimated the theoretical bandwidth of the AWGN channel if the SNR at the receiver is required to be at least 50dB. Each of the elements can assume to brightness levels with equal probability.
Q.10 For a signal the bandwidth is 3KHz and S/N ratio is 15. Calculate the channel capacity

## UNIT-III

Q.1 Which type of errors is introduced in data bits during transmission, explain them with suitable example.
Q.2 What do you mean by forward error correction technique explain it.
Q.3 Explain the concept of checksum error detection technique.
Q.4 Explain the types of errors that occur during data transmission and the methods suitable to minimize each of them.
Q.5 For controlling the error, the parity check bits are appended (channel coding) so is it extra overhead? Justify your answer.
Q.6 Explain types of error.
Q.7 Explain error controlling methods.
Q.8 Explain various types of codes.

Q.9 Explain the types of Automatic repeat request with the help of suitable example.
Q.10 Explain the difference between . Automatic repeat request and forward error correction techniques.

## UNIT-IV

Q.1 Consider a systematic codeword (8,4) whose parity check equations are:

V0=u1+u2+u3
V1=u0+u1+u2
V2=u0+u1+u3
V3=u0+u2+u3

Where u0.u1,u2 and u3 are message digits and v0,v1,v2 and v3 are parity check digits.

(a.) Find the generator and parity check matrices for the code. Show that the minimum distance of this code is 4.
(b.) Construct an encoder for this code.
(c.) Construct a syndrome table and find the transmitted code word if received code word is 10110011 and 10101100.

Q.2 Generator polynomial g(x)=(x3+x+1) is defined for the (7,4) cyclic code.Draw the encoder and decoder diagram. Also calculate for the output of encoder for the input 1001110.

Q.3 Use the generator polynomial g(x)=x3+x+1 to construct all the systematiccode word.

Q.4 Consider the BCH(15,7) double error correcting code with the code word c(x)=x8+x7+x6+x4+1. Determine the outcome of a decoder when c(x) incurs the error pattern

(i) e(x)=x7+x2+1 (ii)e(x)=x11+x9+x6+x4

Q.5 The parity check matrix (H) of a particular (7, 4) linear block code is given by

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 |

i) Find the Generator matrix
ii) Find all the code vectors.
III) Calculate the syndrome decoding table.
iv) How many errors can be detected? How many errors can be corrected?
v) If received codeword is 1011001.Find out the transmitted codeword.

Q.6 The generator polynomial of a (7, 4) cyclic code is defined by $g(x) = 1+x+x^3$. Develop the encoder.Show the contents of shift register in the encoder for a set of input sequence 1011.

Q.7 The generator matrix for a (6, 3) linear block code is

$$G = \left[\begin{array}{ccc:ccc} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{array}\right]$$

(a) Find out the codeword for message block 100 and 010.

(b) Find the location of error in receive vector R 011101.

Q.8 For a (6, 3) linear block code, the three parity check bits $C_4$, $C_5$, and $C_6$ are formed from the following equations: -

$C_4 = d_1 + d_3$

$C_5 = d_1 + d_2 + d_3$

$C_6 = d_1 + d_2$

Where $d_1$, $d_2$, $d_3$ are data bits. Construct generator matrix G.

Q.9 The generator polynomial of a (6. 3) cyclic code is $g(x) = 1+x^2$ .Find the systematic code words for data words 110, 101.

Q.10 Design a syndrome calculator for a (7, 4) cyclic code is generated by $g(x) = 1+x+x^3$. Evaluate the syndrome for receiving sequence 1001101. (Show the contents of shift register)

Q.11 Construct a systematic (7, 4) cyclic code using the generator polynomial $g(x) = x^3+x+1$. What are the error correcting capabilities of this code? Construct the decoding table. If the received word is 1101100, determined transmitted data word.

Q.12 Compare linear block code and binary cyclic code.

Q.13The generator matrix for linear block code is

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

(i) Find out the codeword for message block 1110.

(ii) Decode the receive vector R 1001001

Q.14Write short note on following: -

(i) Systematic code

(ii) BCH code

(iii) Non systematic code

(iv) Huffman code

Q.15Explain cyclic code and its generation.

## UNIT-V

Q.1 Discuss the significance of burst and random error correcting codes.

Q.2 What do you mean by Convolution codes? Explain its encoder with the help of suitable example.

Q.3 Discuss the decoder of Convolution codes with an example.

Q.4 A convolutional encoder has a single shift register with two flip-flop(k=3) three modul-2 adder and an output multiplexer. The generator sequence of the encoder are as following:

g(1)= 1 0 1

g(2)= 1 1 0

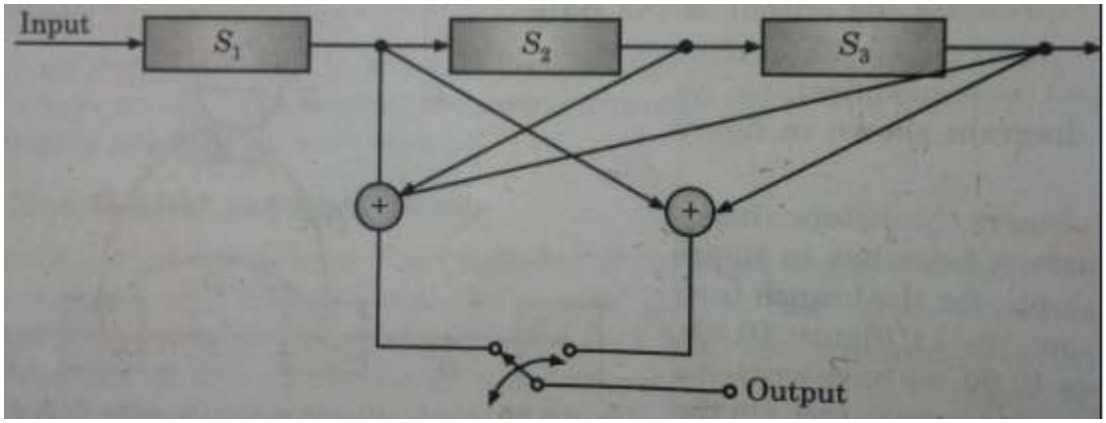
g(3)= 1 1 1

sketch the block diagram of the encoder. Suppose the message sequence is m=10011, then by calculation determine the output of the encoder and the rate r.

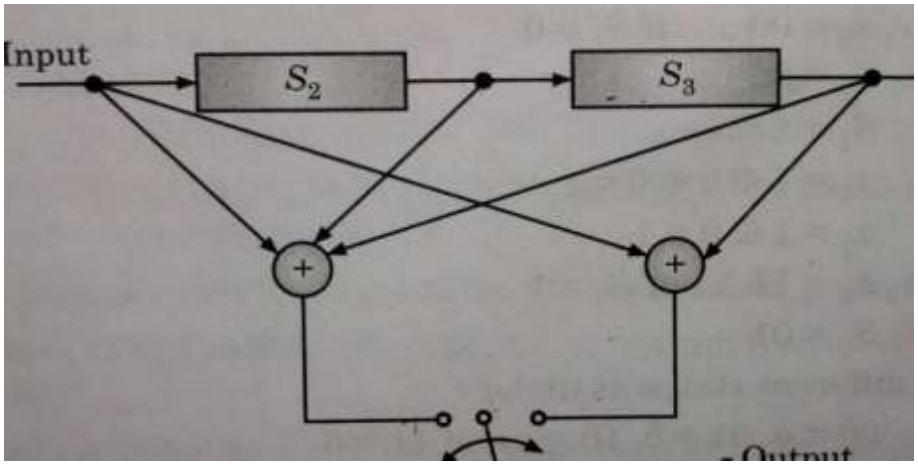
Q.5 Explain the graphical representation for convolutional encoding using code tree with help of suitable example.

Q.6 Explain the code trellis and state diagram of the convolutional code.

Q.7 Determine the state diagram for the convolutional encoder shown in figure. Draw the trellis diagram through the first set of steady state transitions. On the second trellis diagram show the termination of the trellis to all zero state.




Q.8 The encoder shown in figure generates an all zeros sequence which is sent over a binary symmetric channel. The received sequence 01001000. There are two error in this sequence. Show that this double error detection is possible with correction by application by of Viterbi algorithm.



Q.9 Draw the encoder for the (2,1,3) convolutional code with the Given the generator sequence $g^{(1)}$=(1 0 1 1), $g^{(2)}$=(1 1 1 1). And also calculate the transmitted sequence for message 11010.

Q.10 Write short note on any two: -

(i) Constraint length
(ii) Viterbi Decoding
(iii) Transfer function
(iv) Sequential decoding

# Question Bank for B.Tech.VII Sem.End-TermExamination, 2014
# Subject: RADAR AND TV(EC-702)

## UNIT 1

Q.1(a) What are radars. Write down the various applications of radar.

(b) Explain lobe scanning system and conical scanning system.

Q.2 Derive the radar range equation for free space. By what factor does maximum radar distance increase with power increase?

Q.3 Why is clutter undesired? What radar designs minimize it? Explain the methods used.

Q.4 Briefly explain the block diagram of MTI radar and derive the expression for blind speed. Compare blind spot with blind speed.

Q.5 Calculate the maximum range of a radar system which operates at 3cm with peak pulse power of 600kW if its antenna is $5m^2$, minimum detectable signal is $10^{-13}$W and the radar cross sectional area of the target is $20m^2$.

Q.6 Explain Doppler's effect. Hence explain CW Doppler radar with the help of a block diagram.

Q.7 Explain Doppler shift and its role in pulsed radar in CW radar. What is the magnitude of Doppler shift in typical applications?

Q.8 Explain the role of delay line cancellers in MTI Radars.

Q.9 (a) Write a short note on Pulse Doppler Radar.

(b) Explain types of Radar displays.

Q.10 Explain different system losses that occur in radar systems. How range and Doppler measurement is done in frequency modulated CW radar.

## UNIT 2

Q.1 Explain the principle of operation of Radar direction finder system with neat diagrams.

Q.2(a) Compare merits and demerits of LORAN and TACAN.

(b) Explain with neat diagrams the principle of DME(Distance measuring equipment).

Q.3 Explain the principle of LORAN with the help of diagrams.

Q.4 Write a short note on TACAN. Explain the round-trip travel time in case of TACAN.

Q.5 Explain the working principle of Aircraft landing system. Explain the marker system in aircraft landing system.

Q.6 Define astigmatism and coma errors with reference to a P.I.L. tube and describe the field distribution.

Q.7 (a)Describe different techniques of scanning. Discuss interlaced scanning

and how does it effect the flicker and noise.

(b) Discuss the origin and effects of 'dark current' in vidicon camera tube.

Q.8 Discuss the functioning of an image orthicon. Discuss why the electron beam velocity is brought close to zero on reaching the target plate?

(b) Discuss aspect ratio in TV systems. Give reasons for choosing rectangular frame with aspect ratio (4/3) for television transmission and reception. Discuss why now aspect ratio of 16/9 is preferred?

Q.9 (a) Distinguish between luminance and chrominance signal. Describe 'white balancing'and its need.

(b) Compare the design features of television transmitter employing high level modulation and low level modulation.

Q.10 (a) Explain how the 'Y' and colour difference signals are developed from camera outputs.

(b) Define astigmatism and coma errors with reference to a P.I.L. tube and describe the field distribution.

**UNIT 3**

Q.1 Justify the choice of a rectangular frame with aspect ratio (4/3) for television transmission and reception.

Q.2 Explain with diagrams the principle of LCD, LED and plasma displays.

Q.3 Why scanning is carried out at fast rate? What do you understand by interlaced scanning? Show that it reduces flicker and conserve bandwidth

Q.4(a) why is FM preferred to AM for sound signal transmission?

(b) Describe how static and dynamic convergences are adjusted.

Q.5 what do you understand by active and blanking periods in horizontal and vertical scanning? Give the periods of nominal, active and retrace intervals of horizontal and vertical scanning as used in 625 line system.

Q.6 Show that a channel bandwidth of 7MHz is necessary for successful transmission of both picture and sound signals in the 625 line TV system. Why sound carrier is located 5.5MHz away from the picture carrier?

Q.7 Explain with suitable diagram the encoding process in the PAL colour system. Why is the burst signal transmitted after each scanning line?

Q.8 Explain the basic principle of a solid state image scanner. Describe how CCD array is scanned to provide interlaced scanning.

Q.9 why is the electron beam velocity brought close to zero on reaching the target plate, in an image orthicon? Explain the principle involved with diagram.

Q.10 Justify the choice of 625 lines for TV transmission. Why the total number of lines is kept odd in all television systems?

**UNIT 4**

Q.1 what do you understand by compatibility in TV transmission? Enumerate essential requirements that must be met to make a color system fully compatible.

Q.2 Explain how the 'Y' and color difference signals are developed from camera outputs.

Q.3 Explain the importance of 'Y' signal. Why is the 'Y' signal set at 0.3R+0.59G-0.11B?

Q.4 Compare the design features of television transmitter employing high level modulation and low level modulation.

Q.5 Define astigmatism and coma errors with reference to a P.I.L. tube and describe the field distribution.

Q.6 Write a short note on (i) microwave TV relay system (ii) TV via satellite (iii) VCR and VCPs.

Q.7(a) Explain, in detail, transmitting and receiving antennas.

(b) Define purity and convergence and explain why static and dynamic corrections become necessary to obtain color purity and coincident raster?

Q.8 Distinguish between luminance and chrominance signal. Why is white balancing necessary?

Q.9(a) Why is range of TV communication limited? Describe method of increasing line of sight.

(b) Distinguish between luminance and chrominance signal. Describe 'white balancing' and its need.

Q.10 Explain how by frequency interleaving the color information is accommodated within the same channel bandwidth of 7MHz.

**UNIT 5**

Q.1(a) What is a BALUN? Explain how it can be used as an impedance matching network.

(b) Describe the methods of fine tuning in RF tuner. How automatic fine tuning is achieved?

Q.2 Discuss the factors affecting the choice of IF. Draw a circuit diagram of a sync separator and explain its working.

Q.3 Explain how sync pulses are separated from the composite video signal and processed to synchronize the vertical and horizontal oscillators.

Q.4 Explain with a circuit diagram how the high voltage pulses, induced in the output transformer windings, are used to generate EHT supply?

Q.5 Draw the block diagram of AFC circuit and explain how the control voltage is developed?

Q.6 Explain with suitable phasor diagram the phase relationship between the input and output of the tuned circuit when the input signal frequency is varied below and above resonance?

Q.7 Sketch the sectional view of a picture tube that employs electrostatic focusing and electromagnetic deflection.

Q.8(a) Explain geometric destoration in raster.

(b) What are the basic principle employed in HDTV and 3D-TV? Compare the key features of HDTV and 3D-TV.

Q.9 Describe with simple block diagram the circuit arrangement of a VHF tuner. Why does an RF amplifier stage always precede the mixer?

Q.10(a) Describe horizontal and vertical deflection system in vertical output stage.

(b) Explain the block diagram of TV receiver.

**********

# Question Bank for B.Tech. V Sem. End-Term Examination, 2014

## Subject: Optical fiber communication (EC703)

### Unit- 1

Q1. Draw the Block Diagram of optical communication system and explain all the components of the system. Give the reasons for need of fiber optic communication.

Q2(a) What is difference between Satellite communication and optical communication? What are advantages of optical communication?

(b)What is Evolution of light wave system?

Q3. Describe the mechanism for the transmission of light within an optical fiber. What is meant by the acceptance angle for an optical fiber . Show how this is related to the fiber numerical aperture and the refractive indices for the fiber core and cladding .

Q4. Describe with the aid of simple ray diagrams:

(a) The multimode step index fiber

(b) The single mode step index fiber

Compare the advantages and disadvantages of these two types of fiber for use as an optical channel.

Q5. The relative refractive index difference for an optical fiber designed for long distance transmission is 1% Estimate the NA and the solid acceptance angle in air for the fiber when the core index is 1.46 . Calculate the critical at the core cladding interface within the fiber .

Q6.Expalin the following terms :

(a) Mode field diameter
(b) Group delay
(c) Mode delay
(d) Mode volume
(e) Effective refractive index

Q7.A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47

Determine: (a) the critical angle at core cladding interface (b) the NA for the fiber (c) acceptance angle in air

Q 8 . Explain the mode of propagation with their diagram.

A multimode step index fiber has a relative refractive index difference of 1% and a core refractive index of 1.5 .The number of modes propagation aty a wavelength of 1.3μm is 1100 .Estimate the diameter nof the fiber core.

Q9. (a) Briefly indicate with the aid of suitable diagrams the difference between meridional and skew ray path in step index fibers.

(b) A step index fiber with a suitable large core diameter for ray theory consideration has a core and cladding refractive indices of 1.44 and 1.42 respectively. Calculate the acceptance angle in air for skew rays which change direction by $150^0$ ate each reflection

Q10 .Write Short note:

(a) Planer waveguide
(b) Single and multimode fiber
(c) Cylindrical waveguide

**Unit- 2**

Q1. When the mean optical power launched into an 8 km length of fiber is 120μW , the mean optical power at the fiber output is 3μW.

Determine :

(a) The overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices ;
(b) The signal attenuation per kilometer for the fiber
(c) The overall signal attenuation for a 10km optical link using the same fiber with splices at 1km intervals each giving attenuation of 1dB
(d) The numerical input/output power ratio in (c)

(b)Discuss absorption losses in optical fibers ,comparing and contrasting the intrinsic and extrinsic ,absorption mechanism.

Q2.(a) Describe linear scattering losses in optical fibers with regards to :

(a) Rayleigh Scattering
(b) Mie Scattering

(b)Two Step index fibers exhibit the following parameters :

(a) A multimode fiber a core refractive index of 1.500 , a relative refractive index difference of 3% and an operating of 0.82μm;
(b) An 8μm core diameter single mode fiber with a core refractive index the same as (a) a relative refractive index difference of 0.3% and an operating wavelength of 1.55 μm.

Q3.(a)Compare stimulated Brillouin and Raman scattering in optical fibers and indicate the way in which they may be avoided in optical fiber communication .

(b)A multimode graded index fiber exhibits total pulse broadening of 0.1 μs over a distance 15km .Estimate:

(i) the maximum possible bandwidth on the link assuming no inter symbol interface;
(ii) the pulse dispersion per unit length ;
(iii) the bandwidth length product for the fiber

Q4 (a).Explain the reasons for pulse broadening due to material dispersion in optical fibers.

(b)A 6 km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1% .Find;

(i)the delay difference between the slowest and fastest modes at the fiber output ;
(ii) the rms pulse broadening due to intermodal dispersion on the link;
(iii) the bandwidth length product corresponding to (c).
(iv)the maximum bit rate that may be obtained without substainel errors on the link assuming only intermodal dispersion.

Q5.(a) Describe the phenomenon of modal noise in optical fibers and suggest how it may be avoided.

(b)Describe how intramodal dispersion may be minimized within the single mode region.

Q6(a). Describe the polarization mode dispersion in single mode optical fibers.

(b)Explain what is meant by:

(a) Fiber birefringence
(b) The beat length in single mode fiber

Q7. Describe the techniques employed and the fiber structures utilized to provide :

(a) Dispersion shifted single mode fibers
(b) Dispersion flattened single mode fibers
(c) Nonzero dispersion shifted single mode fibers

Q8.(a) Show that the total broadening of a light pulse $\delta$Ts due to intermodal dispersion in a multimode step indexfiber may be given by:

l

$$\delta Ts \approx L(NA)2/2n1c$$

(b)A multimode step index fiber has a numerical aperture of 0.3 and a core refractive index of 1.45 . the material dispersion parameter for the fiber is 250 ps $nm^{-1}$ $km^{-1}$ which makes dispersion parameter for the fiber is 250 ps $nm^{-1}$ $km^{-1}$ which makes material dispersion the totally dominating chromatic dispersion mechanism .estimate

(a) The total rms pulse broadening per kilometer when the fiber is used with an LED source of rms spectral width 50nm.

(b) The corresponding bandwidth length product for the fiber .

Q9.(a) Explain the reasons for pulse broadening due to material dispersion in optical fibers.

The group delay $\tau$g in an optical fiber is given by :

$$\tau g = 1/c \ (n1 - \lambda dn1/d\lambda)$$

(b)Derive the experssion for the rms pulse broadening due to material dispersion in an optical fiber and define the material dispersion parameter

Q 10. The threshold optical power for stimulated brillouin scattering at a wavelength of 0.85µm in along single mode fiber using an injection laser source with a band width of 800 MHz is 127mW .The fiber has an attenuation of 2dB $km^{-1}$ at this wavelength. Determine the thershold optical power for stimulated raman scattering within the fiber at a wavelength of 0.9µm assuming the fiber attenuation is reuced to 1.8dB$km^{-1}$ at this wavelength.

**Unit- 3**

Q1. Discuss the areas in which the injection laser fulfills these requirements and any drawback of using this device as an optical fiber communication source.

Q2. Discuss the requirement for population inversion in order that stimulated emission may dominate over spontaneous emission .

Q3. Discuss the optical mechanism of optical feedback to provide oscillation and hence amplification within the laser .

Q4. Discuss the concept of Einstein relation for optical fiber and derive it.

Q5.(a) Compare the approximate radiative minority carrier lifetimes in gallium arsenide and silicon when the minority carriers are electron injected into the p-type region which has a hole concentration of $10^{18}$ $cm^{-3}$ . the injected electron density is small compared with the majority carrier density .

(b)Discuss the concept of direct band gap and indirect band gap semiconductor.

Q7. Discuss the mechanism emission of light from an LED .Discuss the effect of this mechanism on the properties of the LED in relation to its use as an optical source for communication.
Q8. Briefly outline the advantages and drawbacks of the LED in comparison with the injection laser for use as a source in optical fiber communication.
Q9.Discuss the LED structures for optical fiber communication relative merits and drawback .In particular compare surface and edge emitting devices .Distinction between multimode and single mode devices.
Q10. Explain the difference in the performance characteristics between the conventional LEDs used for optical fiber communication and super luminescent LEDs.

**Unit-4**

Q1. Discuss in detail the pin photo diode with regards to performance and compatibility requirements in photo detection in optical fiber communication .
Q2. Explain the detection process in the p-n photodiode .Compare this device with the pin photodiode
Q3.(a) Define the quantum efficiency and the responstivity of detector
(b)A p-n photodiode has a quantum efficiency of 50% at a wavelength of 0.9 μm .calculate:

(a) Its restivity at 0.9μm;
(b) The received optical power if the mean photocurrent is 10-6 A;
(c) The corresponding number of received photons at this wavelength.

Q4. A pin photodiodes ceases to operate when photons with energy greater than 0.866eV are incident upon it; of which material is it fabricated.
Q5. Describe in detail what is meant by noise in optical fiber and how can be it classified .
Q6. Explain the following :

(a) Noise in p-n diode
(b) Noise pin diode
(c) Noise in APD receiver

Q7.Explainthe principle of PIN photodiodes & avalanche photodiode. Differentiate their characteristics .

Q8(a).An analog optical fiber system operating at a wavelength of 1μm has a post detection bandwidth of 5MHz. Assuming an ideal detector and consisting only quantum noise on the signal ,calculate the incident optical power necessary to achieve an SNR of 50dB at the receiver.
(b)Show that the analog transmission quantum noise is given by :

$$S/N = \eta Po/2hfB$$

Q9. Explain the charectesrtics of photoconductor and phototransistor with their diagram

Q10 .A digital optical fiber communication system operating at a wavelength of 1μm requires a maximum bit error rate of $10^{-9}$ determine :

(a) The theoretical quantum limit at the receiver in terms of quantum efficiency of the detector and the energy of an incident photon;
(b) The minimum incident optical power required at the detector in order to achieve the above bit error rate when the system is employing ideal binary signaling at 10 Mbit $s^{-1}$ and assuming the detector is ideal .

**Unit -5**

Q1 . Discuss the major consideration in the design of digital drive circuits for:
(a) an LED source
(b) an injection laser source

Illustrate with an example of a drive circuit for each source.
Q2 .Discuss the block diagram the function of the major elements of an optical fiber receiver .Describe the techniques for automatic gain control in APD receiver.
Q3. Describe the principle components of optical fiber communication with their diagram.
Q4.Describe the optical transmitter circuit and optical receiver circuit with their diagram
Q5. Explain the following :
(a)Regenerative repeater
(b)BER of optical receiver
(c) channel losses
(d) ISI penalty
Q6 .Discuss the concept of optical power budgeting for digital optical fiber system.
Q7. Explain the following term with their diagrams :
(a) the pre amplifier
(b) automatic gain control
(c) equalization

Q8. Explain the concept of channel losses and optical power budget in digital system planning
Q9. What is optoelectronic regenerative repeater . Discuss the concept of laser drive circuit.
Q10.Write short note on :
(a) ISI penalty
(b) BER of optical fiber
(c) Digital system
(d) AGC

# Question Bank for B.Tech. VI Sem. End-Term Examination, 2014

# Subject- VLSI Architecture for Signal Processing & Communication System (EC704)

## Unit – I

Q.1 Explain working and construction of N- channel Depletion type MOSFET transistor.

Q.2 Describe the construction and working of P-channel depletion type MOSFET transistor.

Q.3 (a) Differentiate Enhancement and Depletion type MOS.

(b) Discuss the advantages of CMOS design over PMOS or NMOS designs

Q.4 Explain the working and construction of n-channel enhancement type MOSFET transistor.

Q.5 Explain the working and construction of P-channel enhancement type MOSFET transistor.

Q.6 Explain the characteristic and construction of CMOS transistor

Q.7 Write short notes on

(i) MOS transistor switch

(ii) NMOS fabrication

Q.8 Describe the characteristics of N- channel Depletion type MOSFET transistor.

Q.9 Describe the characteristics of N- channel Enhancement type MOSFET transistor.

Q.10 Write short notes on

(i) Enhancement type MOSFET

(ii) Depletion type MOSFET

**Unit – II**

Q.1 (a) For a 0.8 um process technology $t_{ox}$ =15 nm and $\mu_n$=550cm$^2$/VS. Find $C_{GS}$ , k'$_n$ , and the over drive voltage $V_{ov}$ required to operate a transistor having W/L=20 in saturation with $I_D$ = 0.2mA. What is the minimum value of $V_{DS}$ needed.

(b) Explain the MOSFET switches in brief.

Q.2 For the CMOS inverter with matched MOSFET having $V_t$=1V, $V_{DD}$ =5V Find the $V_{IL}$, $V_{IH}$ and noise margin.

Q.3 (a) Explain Pull up & Pull down ration for an NMOS inverter.

(b) Explain Pull up & Pull down ration for an CMOS inverter.

Q.4 Derive the relation between $I_d$ and $V_{ds}$ for Enhancement type MOSFET

Q.5 (a) Implement the following equation using CMOS logic circuit.

Y= ((A.B.C)+D)'

(b) Design the 3 input OR gate using CMOS logic circuit.

Q.6 (a) Design the 4:1 Multiplexer using CMOS logic circuit.

(b) Design the 2 input NAND gate using CMOS logic circuit.

Q.7 Draw the corresponding circuit diagram for the logic function $Y = \overline{(D + E + A)}\left(\overline{B + C}\right)$. Also calculate equivalent W/L ratio for nMOS and pMOS. Assume that (W/L)p=15 for all pMOS transistor and (W/L)n=10 for all nMOS transistor

Q.8 Write short notes on

(i) Threshold voltage

(ii) Transistor Trans-conductance gm

Q.9 Write short notes on

(i) MOS transistor circuit Model

(ii) Noise Margin

Q.10 Explain the Threshold voltage (body effect) static characteristic of MOS transistor.

## Unit – III

Q.1 Draw and explain the switching characteristics for CMOS inverters.

Q.2 Explain the design parameters of CMOS inverter.

Q.3 (a) Describe the static characteristics of CMOS inverters.

(b) Describe the switching characteristics of CMOS inverter.

Q.4 (a) Discuss the design issues in designing low power VLSI circuits.

(b) Describe the dynamic characteristics of CMOS inverters.

Q.5 Explain the following

(i) Memory Latchs (ii) Registers (iii) Transmission Gate

Q.6 What is CMOS transistor sizing? Explain with example.

Q.7 What is CMOS transmission gate? Design a CMOS Inverter using CMOS transmission gate.

Q.8 (a) Implement the following equation using CMOS logic circuit.

Y= ((A+B+C).D)'

(b) Design the 3 input NOR gate using CMOS logic circuit.

Q. 9 (a) Implement the following equation using CMOS logic circuit

Y= ((AB+CD).E)'

(b) Design the 2- input OR gate using CMOS logic circuit.

Q.10 Draw the CMOS circuit for following function-

(i) F = $\overline{(A + BC)}$

(ii) Y=(A.B.C)+(A+B+C)

## Unit – IV

Q.1 Draw the CMOS circuit layout and stick diagram of following function-

F= $\overline{(A.B + C)}$

Q.2 (a) Draw and explain stick diagram for 2-input NOR gate.

(b) Describe design rules and layout for NMOS design.

Q.3 Draw and explain layout diagram for 2-input CMOS NOR gate.

Q.4 (a) Describe stick diagrams. Draw and explain stick diagram for 2-input NAND gate.

(b) Describe design rules and layout for PMOS design.

Q.5 (a) Draw and explain layout diagram for 2-input CMOS NAND gate.

(b) Describe design rules for CMOS.

Q.6 Explain the stick and layout diagram of NMOS inverter.

Q.7 (a) Draw and explain stick diagram for 3-input NOR gate.

(b) Draw and explain layout diagram for 2-input CMOS NAND gate.

Q.8 Describe Lambda based design rules for CMOS.

Q.9 Design Following CMOS logics

(i) Y=A.B+C.(A+B)

(ii) Y= (A+B).C+(A.B)

Q.10 Describe Micron based design rule, how it is different than Lambda based design rules?

## Unit – V

Q.1 Write the VHDL code for T-flip flop in behavioural design.

Q.2 Write the VHDL code for 3 X 8 Decoder in Data flow design.

Q.3 Write the VHDL code for D Flip Flop in behavioural style.

Q.4 Write the VHDL code for Half Adder using the following architecture modeling style:

(i) Data flow style

(ii) Behaviour Style

Q.5 Define with the suitable example (any four)-

(a) Entity (b) Signal (c) Packages

(d) Components (e) Function (f) Data types

Q.6 Write VHDL code for half adder using the following architecture modeling style.

(a) Data flow modeling

(b) Behavior modeling

(c) Structural modeling

Q.7 Write the VHDL code for J-K-flip flop in behavioural design.

Q.8 Write the VHDL code for full adder in structural modeling style.

Q.9 Write the VHDL code for 4X1 multiplexer in behavioural style.

Q.10 Write the VHDL code for S-R flip flop in structural modeling style.

**Question Bank for B.Tech. VII Sem. End-Term Examination, 2014**

# Subject: Embedded System (EC-705,IT-703,CS-703)

## UNIT I

Q.1 Expalin all possible method of interfacing of DMA with micro-processor?

Q.2 What is interrupt? Explain how a shared data problem increases interrupt latency?

Q.3 Explain the architecture of basic micro-processor? Also explain the internal buses of microprocessor?

Q.4 How can we connect memory with I/O devices without micro-processor, Explain the possible methods?

Q.5 What do you mean by timing diagram? Explain the timing diagram of D-flip flop.

Q.6 What is embedded system? Which are the basic challenges of Embedded system designing?

Q.7 What is setup time, hold time and propagation delay? Explain the terms with the help of timing diagram?

Q.8 What is loading problem? How can a loading problem can be control?

Q.9 Explain the types and characteristics of memory use in embedded system.

Q.10 What is the role of ROM in microprocessor? Explain the ROM variants.

## UNIT II

Q.1 Explain the architecture of PIC micro-Controller?

Q.2 Explain the following PIC registers

a) INTCON

b) PIE1

c) STATUS

d) TRIS

Q. 3 Explain the Addressing Modes and relevant Instruction of PIC micro-controller?

Q.4 How an Analog device can connect with PIC Micro-Controller, explain the roll of ADCON register in analog interfacing of PIC micro-controller?

Q.5 Explain the following instruction of PIC microcontroller

a) SWAPF f,d b) CLRWDT

c) BDC d) CALL

Q.6 Explain the types of instruction set of PIC microcontroller. With example?

Q.7 Explain the following instruction of PIC microcontroller

a) BCF f,b b) BTFSC f,b

c) INCFSZ f,d d) COMF f,d

Q.7 What is interrupt service routine? How many interrupts are there in PIC microcontroller? How can we control interrupts in PIC?

Q.8 Explain the following PIC registers

a) ADCON

b) CCP1CON

c) ANSEL

d) PCL & PCLATH

Q.9 Explain the following terms-

a) Harvard architecture c) Frequency Measurement

b) Prescaler d) Interrupt vector & Priority

Q.10 Explain the CCP MODE of PIC microcontroller. What is the difference between CCP1 and CCP2 mode?

**UNIT III**

Q.1. Explain the processor modes of ARM controller.

Q.2. Explain types of registers in ARM.

Q.3. What is pipelining? Explain different stages of pipelining in ARM9.

Q.4 What is Exception? Explain the Exceptions of ARM9 .

Q.5. Explain the program status register of ARM.

Q.6. Explain following terms of ARM

(i) IRQ (ii) FIQ (iii) Data Type (iv) Endian

Q.7. What is difference between pre-fetch abort and data abort. Explain Abort mode of ARM.

Q.8 Draw and describe internal architecture of ARM9.

Q.9 Why ARM has different operating mode? Explain all mode of ARM.

Q.10 Write short notes on following-

(i) Exception (ii) Data types (iii) THUMB

**UNIT IV**

Q.1 What are the basic differences between Assembler, Compiler, Cross Compile and simulator?

Q.2 What is the roll of integrated development environment(IDE) in embedded software development?

Q.3 Explain the following terms-

(a) Debugging (b) Algorithms

Q.4 Differentiate the following terms

a) Compiler and Cross Compiler

b) Integrated development environment & Simulator

Q.5 How a concept of object oriented interfacing is useful in embedded system designing?

Q.6 What do you mean by scheduling explain the Function-Queue-Scheduling architecture?

Q.7 Explain the following terms-

a) Recursion

b) Debugging

c) Assembler

Q.8 Explain the round robin architecture and round robin with interrupts.

Q.9 Explain the characteristic of round robin with interrupts architecture, with proper example.

Q.10 Write down round robin and function–queue scheduling algorithm.

**UNIT V**

Q.1 Explain the memory management technique of Real time Operating System?

Q.2 What is semaphore? How a semaphore helps to share a data?

Q.3 Explain the following terms-

(a) Task and task states (b) Message Queue

(c) Interrupt handling (d) Semaphore

Q.3 How interrupts can be serve in RTOS environment?

Q.4 What are the basic difference between RTOS and OS? Explain the Timer function of RTOS.

Q.5 How can we differentiate a message queue with semaphore, also explain the application of message queue and semaphore in RTOS?

Q.6 How a share data problem can be remove in RTOS, Explain with example?

Q.7 What is mutex? Explain the types of semaphore.

Q.8 What is relation between tasks and data in RTOS environment?

Q.9 Define the term Reentrancy. What do you mean by Reentrant functions?

Q.10 What is role of Event in RTOS environment?

## Question Bank for B.Tech. VII Sem. End-Term Examination, 2014

## Subject: Robotics (EC706)

**UNIT 1**

1. What do you mean by the term robotics? Clearly classify them as industrial, non-industrial and special purpose.
2. What are the thumb rules of decision of robot usage. Explain them on the basis of application, population, economics and safety.
3. What the laws of robotics and explain them as beneficial for human kind.
4. Draw the diagrams of the following :
   a) Cincinnati Milacron
   b) An automatic guided vehicle
   c) A walking robot
5. Explain clearly what you mean by robot subsystems.
6. Explain the various parts of motion subsystems.
7. Elucidate recognition subsystem and control subsystem.
8. Classify robots on the basis of coordinate system and actuation system.
9. Explain robot classification by control method
10. Elucidate robotics classification by application, actuation system and programming method

**UNIT 2**

1. Explain, with diagram, the term manipulators and wrists.

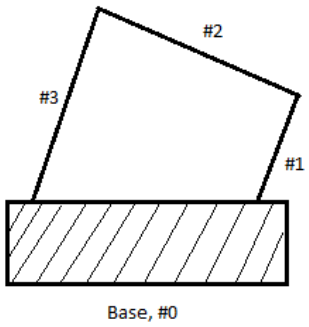
2. What is an actuator? Explain its various parts along with block diagram and also classify them.
3. What do you mean by pneumatic actuator? Draw its block diagram and also mention ist advantages and disadvantages.
4. What do you mean by hydraulic actuator? Draw its block diagram and also mention ist advantages and disadvantages.
5. Clearly explain the working of stepper motor. Also explain its various types.
6. Clearly explain the working of DC motor. Also explain its various types.
7. Clearly explain the working of AC motor. Also explain its various types.
8. What are the steps that one should follow while selecting any motor for some particular application.
9. Describe the functional differences of stepper, DC and AC motor.
10. What do you mean by servomotor and why DC motors are preferred as servomotors?

**UNIT 3**

1. What do you mean by sensors? Point out the application of sensors in the field of robotics. What capabilities a sensor must possess?
2. Draw the tree diagram of sensor classification. Explain all its subparts clearly.
3. Explain position sensor. Explain each of its type clearly (with diagrams).
4. Explain velocity sensors and acceleration sensors with relevant diagram.
5. Explain force sensors along with each of its type. (Diagrams included)
6. What do you mean by external sensors? Clearly explain the contact type sensor with relevant diagram.
7. Explain clearly the term proximity sensor. Elucidate inductive proximity sensors and capacitive proximity sensors.
8. What do you mean by vision system? Explain the elements of vision system.
9. Write short notes on :
    a) Image Acquisition
    b) Image Processing
10. What are the criteria of selecting a sensor for any particular application.

**UNIT 4**

1. What do you mean by robot architecture? Explain the term in reference to various types of joints.
2. Explain the terms kinematic chain and degree of freedom clearly. Calculate the degree of freedom of the following four bar mechanism.

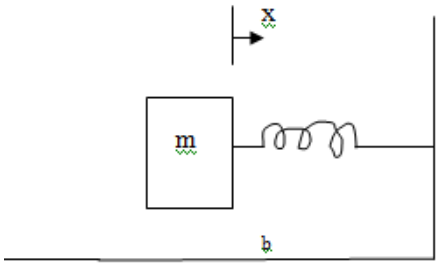



3. A) What do you mean by the term "control techniques" (in reference to robotics? Explain with example.

   B) Explain the terms MIMO and SISO. What are the different ways to control a SISO system?
4. Describe the term feedback control. Draw the block diagram of a hardware implementation of closed loop controller. Write the expression of equation of motion, explaining its various parameters.
5. Transfer function of a system is given as

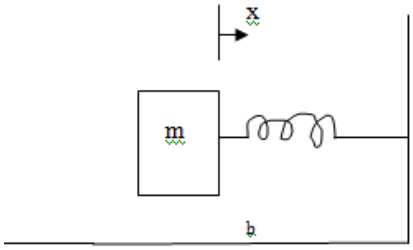
$$G(s) = \frac{0.2}{0.1s^2 + 0.6s + 1}$$

   Find its natural frequency and damping ratio. Write a simple MATLAB program to obtain its impulse response.
6. For the simple spring-mass system shown below (with parameters m= 1, b=5 and k = 6), write the characteristic equation.



Initial conditions being x(0)=-1 and $\dot{x}(0) = 0$, calculate its response. Also draw the response using MATLAB.

7. Explain the term "joint controller" in reference to any two of the following:
   a) PD controller
   b) PID controller
   c) Selection of controller gains
8. Explain the Lyapunov's method. What are the criteria for a system to be stable using Lyapunov's method? Comment on the stability of the mass spring system shown below




   m = 1, b = 5, k = 6.
9. Explain the term forward and inverse kinematics in reference to Cartesian Control. Also explain the term force control.
10. Find the coefficients of a cubic polynomial

    $\theta(t) = a_0 + a_1 t + a_2 t^2 + a_3 t^3$

    Given that $\theta(0) = 1, \theta = 2, \theta = 3$ *and* $\ddot{\theta}(t_f) = 30°$.

**UNIT 5**

1. What are the various methods speeding up the software calculations? Calculate sin(0.8034) where sin(0.8) = $a_1$and cos(0.8) = $a_2$.
2. What hardware considerations are made for speeding up purpose?
3. Design the architecture to decouple the servo calculation. What characteristics a *chip* must possess for such purpose.
4. What are the functions of a control system? Elucidate each point clearly.
5. What do you mean by online robot programming? Mention at least three advantages and three disadvantages.

6. Explain the terms “lead through programming” and “walk through programming”.
7. Explain offline programming, mentioning its advantages and disadvantages. What are the features that robotic programming must be rigged with?
8. What do you mean by robot oriented programming? What are the various features of such a language? Mention the steps taken during development of such a program.
9. Why task level programming is difficult?
10. Write a MATLAB program for speeding up the calculation for sin(0.8034) and mention the execution time.