Code : 1G244 **R-13**

II B.Tech. II Semester Regular Examinations May 2015

Linear Control Systems

(Common to EEE & ECE)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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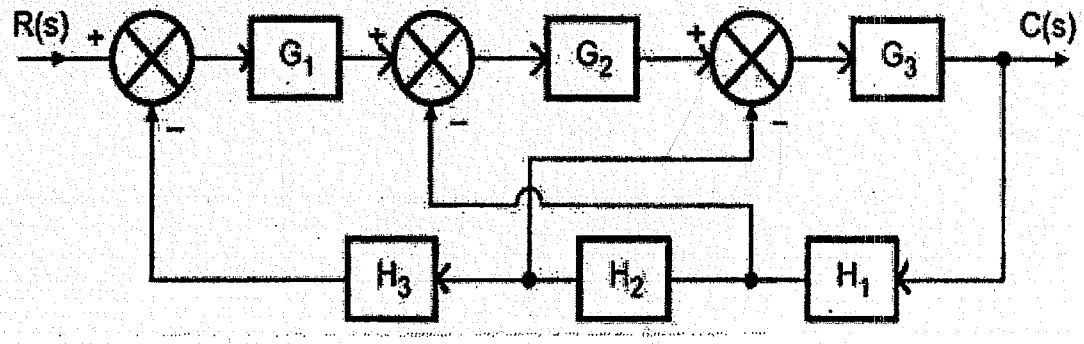
1. a) Explain the difference between systems with feedback and without feedback.
   b) Find the transfer function C(s) R(s) of a system having differential equation. $9d^2c(t)/dt^2 + 12dc(t)/dt + c(t) = r(t) + 2r(t-1)$.
2. a) Explain the working principle of synchro receiver with neat sketch.
   b) Reduce the given block diagram and hence obtain the transfer function C(s)/R(s)



3. a) Write the specifications of a second order system
   b) Sketch the impulse response of a second order system when damping factor is
      i) 0 **ii)** Between 0 and 1 **iii)** Greater than 1
4. a) Construct Routh array and determine the stability of the system whose characteristic equation is S6 + 2S5 + 8S4 + 12S3 + 20S2 16S16 = 0. Also determine the no. of roots lying on right half of s-plane, left half of s-plane and on imaginary axis?
   b) Check whether the points (-1+ j) and (-3+ j) lie on the root locus of a system given by G(s)H(s) = K/(s+1)(s+2) . Use the angle condition.
5. Write short notes:
   (a) Frequency domain specifications
   (b) Stability analysis from Bode plots.
6. With the help of Nyquist plot assess the stability of a system
   G(s) = 3/s(s+1)(s+2)
   What happens to stability if the numerator of the function is changed from 3 to 30?
7. a) Distinguish between lag compensator and lead-lag Compensator.
   b) Explain various steps involved in design of lag compensator using Bode plot
8. a) Construct the state model for a system characterized by the differential equation. $\ddot{y} + 5\dot{y} + 6y = u$.
   b) Obtain the state model for armature controlled DC Motor.

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Code : 1GC41 **R-13**

II B.Tech II Semester Regular Examinations May 2015

Mathematics-III

(Common to EEE & ECE)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Show that $\beta(m,n)=\int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}dx$ 7M

   b) Prove that $\int_0^1 \frac{x^2dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$ 7M

2. a) If $u(x,y)$ and $v(x,y)$ are harmonic functions in a region R, show that the function $(\frac{\partial u}{\partial y}-\frac{\partial v}{\partial x})+i(\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y})$ is an analytic function. 7M

   b) If $f(z)=u+iv$ is an analytic function of z and if $u-v=e^x(\cos y-\sin y)$, find $f(z)$ in terms of z. 7M

3. a) Separate the real and imaginary parts of log sin z. 7M

   b) Find all the roots of the equation $\tanh z+2=0$. 7M

4. a) Evaluate $\int_{1-i}^{2+i}(2x+1+iy)dz$ along the straight line joining $(1-i)$ to $(2+i)$. 7M

   b) Evaluate $\int_C \frac{z^3e^{-z}}{(z-1)^3}dz$ where C is | z – 1 | = ½ using Cauchy's integral formula. 7M

5 a) Expand $f(z)=\frac{z-1}{z+1}$ in Taylor series about the points (i) z = 0 and (ii) z=1 7M

   b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1<|z|<\sqrt{2}$ 7M

6. a) Evaluate $\int_C \frac{e^z}{\cos \pi z}dz$ where C is the unit circle $|z|=1$ 7M

   b) Using complex variable technique show that $\int_0^{\pi} \frac{d\theta}{3+2\cos\theta}=\frac{\pi}{\sqrt{5}}$ 7M

7. a) Applying Rouche's theorem, show that the equation $z^5+15z+1=0$ has one root in the disc $|z|<\frac{3}{2}$ and four roots in the annulus $\frac{3}{2}<|z|<2$. 7M

   b) State and prove the fundamental theorem of algebra. 7M

8. a) Show that the function $w=\frac{4}{z}$ transforms the straight line $x=c$ in the z– plane onto a circle in the w – plane. 7M

   b) Determine the Bilinear transformation which maps $z=0,-i,2i$ into $w=5i,\infty,-i/3$. 7M

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Code : 1G343

R-13

II B.Tech. II Semester Regular Examinations May 2015

Pulse and Digital Circuits

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Explain the pulse response of an RC high pass circuit. 7M

   b) A 10 Hz symmetrical square wave whose peak-to-peak amplitude is 2V is impressed upon a high pass circuit whose lower 3-dB frequency is 5Hz calculate and sketch the output wave form. In particular, what is peak-to-peak output amplitude? 7M

2. a) State and prove clamping circuit theorem. 7M

   b) Design a clipping circuit with ideal components, which can give the waveform shown in Figure 1 for a sinusoidal input.

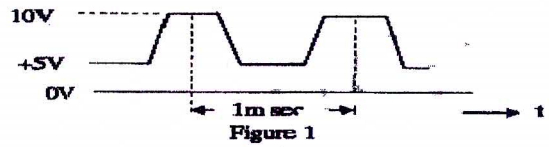

Figure 1

7M

3. a) A transistor switch with a capacitive load behaves differently as compared to the switch with resistive load. Justify the statement with suitable example. 7M

   b) Give the expression for rise time and fall time in terms of transistor parameters and operating currents. 7M

4. a) Explain how a Schmitt trigger can be used as a comparator and as a squaring circuit. 7M

   b) Find lower and upper threshold voltage for Schmitt trigger circuit, with following data. Assume transistor with $h_{FE} = 30$.

   $$V_{cc} = 12V, R_{c1} = 4K\Omega, R_{c2} = 1K\Omega, R_1 = 2K\Omega, R_s = 1K\Omega, R_2 = 6K\Omega, R_e = 3K\Omega,$$ 7M

5. a) Explain how a compensation circuit improves the linearity of a Bootstrap voltage time base generator 7M

   b) Find the component value of a bootstrap sweep generator, given V_{cc}=18V, I_c(sat)=2mA and h_{fe}(min)=30. 7M

6. a) Derive expression for gain and minimum control voltages of a bi-directional two-diode sampling gate. 7M

   b) For the bi directional diode gate Vs =25V, R_F=50Ω, R_L=R_C=200KΩ and R_2=50KΩ. Find the (V_C)min, (V_n)min, gain A and 3-dB frequency of the gate. 7M

7. a) With the help of a circuit diagram and wave form explain frequency division of an astable multivibrator with pulse signal. 7M

   b) (i) What is phase delay and phase jitter?

   (ii) Write the factors which influence the stability of a relaxation divider. 7M

8. a) Draw the circuit of 3-input AND gate using diodes for :

   i) Positive logic.

   ii) Negative logic.

   And explain the operation of the circuit. 7M

   b) Discuss the diode- transistor logic. 7M

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Code : 1G242

R-13

II B.Tech. II Semester Regular Examinations May 2015

Electrical Circuits-II

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Determine the impedance parameters and transmission parameters for the network given in Fig.1

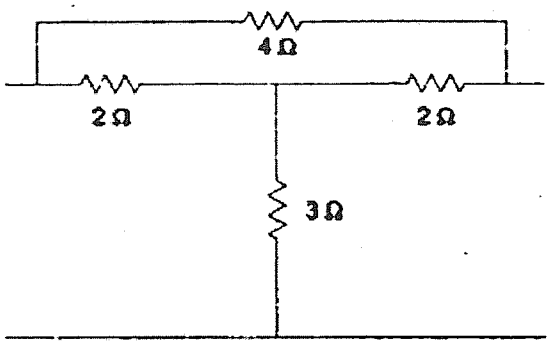


Fig.1

b) Find the Z parameters for the circuit shown in Fig.2

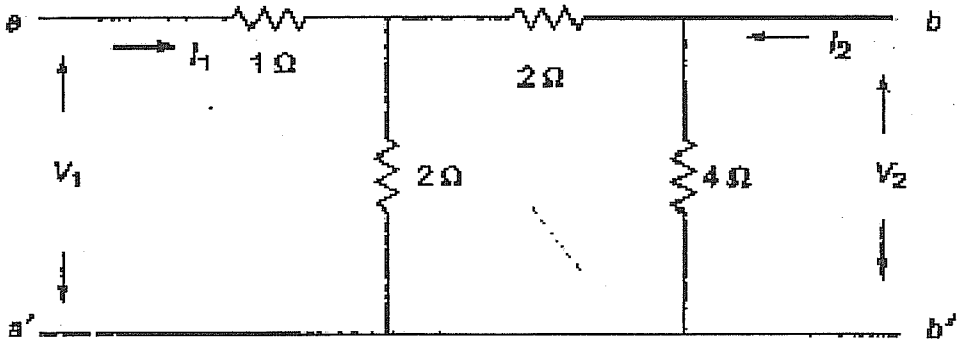


Fig.2

2. a) Show that the number of links for a graph having n nodes and b branches is b-n+1

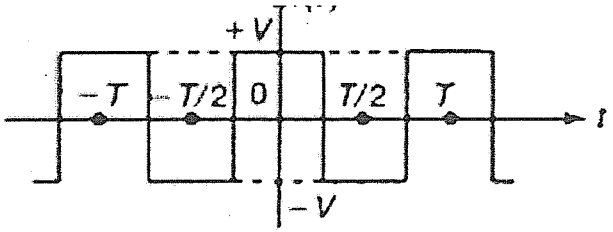
b) Explain the meaning of the following terms with illustrative examples

i) Incidence matrix

ii) Tie-set matrix

iii) Cut-set matrix

3. a) Determine the Fourier series for the square waveform shown below and plot the magnitude and the phase spectra



b) Give the definitions of Fourier transform pair and illustrate its use in network analysis with one example.

4. a) Find the Laplace transform of a saw tooth waveform f(t) which is periodic, with period equal to unity, and is given by f(t)=at for 0<t<1.

   b) Verify the final value theorem for the following functions

   i) $2+e^{-3t}\cos 2t$ ii) $6(1-e^{-t})$

5. a) Consider the following circuit, determine

$$(i)\, i_0(0^+), i_L(0^+) \text{ and } v(0^+) \quad (ii)\, \frac{di(0^+)}{dt} \text{ and } \frac{dv(0^+)}{dt} \quad (iii)\, i(\infty),\ i_L(\infty) \text{ and } v(\infty)$$

assume $v_c(0) = i_L(0) = 0$

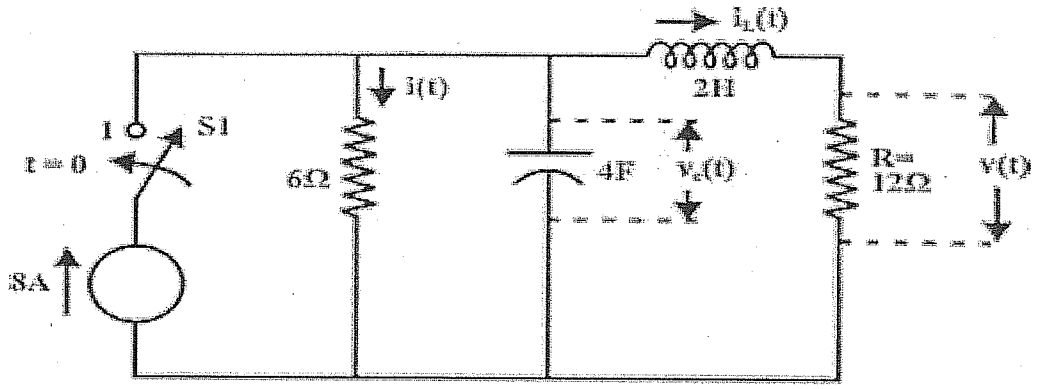


Fig.4

   b) The switch has been closed for a sufficiently long time and then it is opened at in Fig.5. Find the expression for $a)\, v_c(t), b)\, i_c(t), t > 0$ (a) for inductor values of i) L=0.5H ii) L=0.2H iii) 1.0H

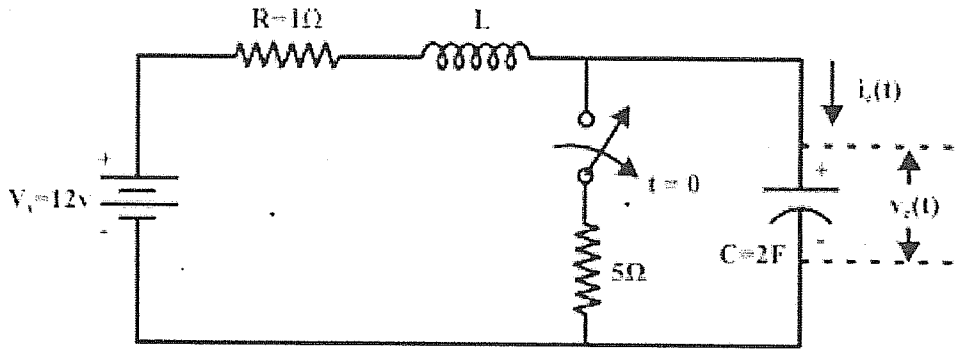
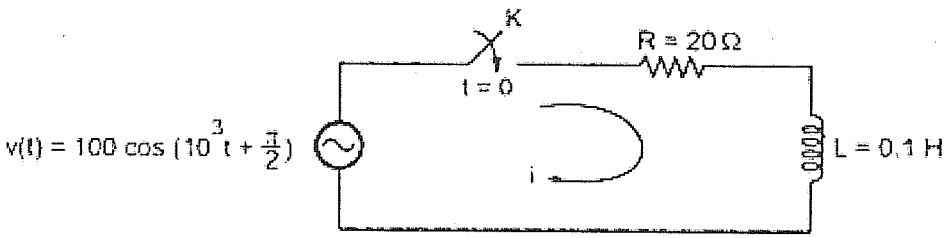


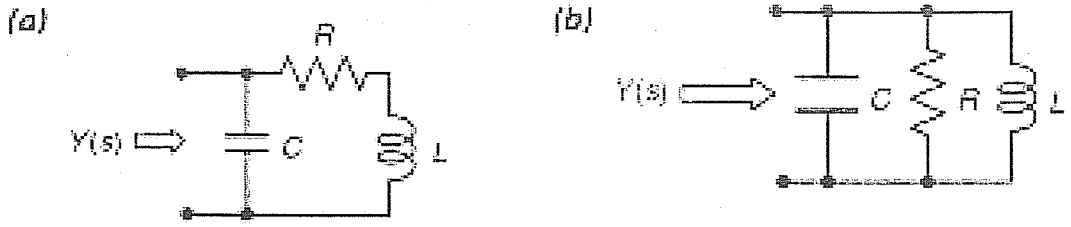
Fig.5

6. a) In the circuit shown in Fig. determine complete solution for current, when switch K is closed at t=0. Applied votltage is v(t) is given as 100 $\cos(10^3 t+\pi/2)$

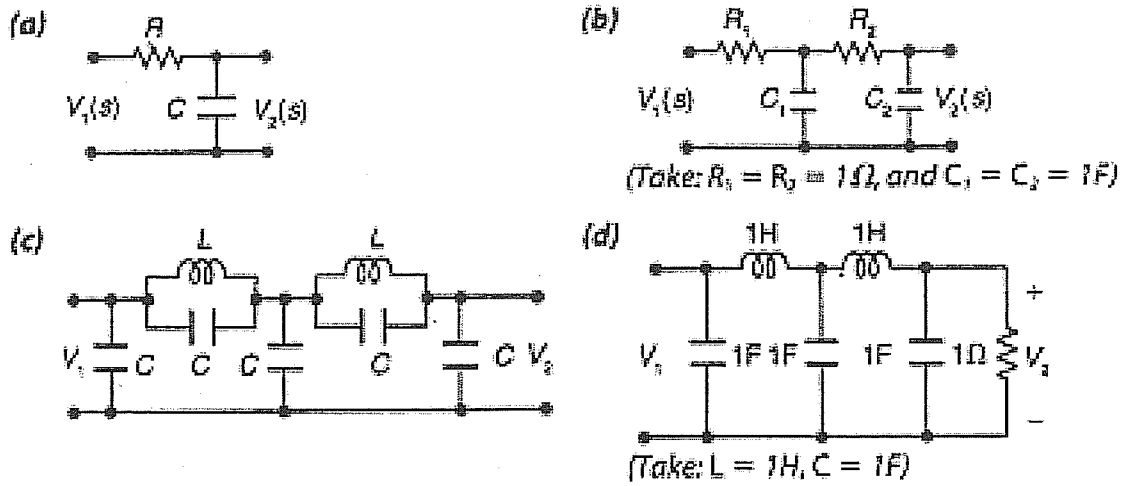


   b) What is the significance of initial conditions? Explain time constant in case of series R-L and series R-C circuit.

7. a) Determine the driving point admittance function for the networks shown in Fig.



b) Determine the voltage transfer ratio $v_2(s)/v_2(s)$ of the networks shown



8. a) Determine if the following two functions are positive real. Give reasons to justify the conclusions

$$\text{i)}\ \frac{(s+2)(s+3)}{(s+1)(s+4)} \qquad \text{b)}\ \frac{(s+2)^2}{s^2+4}$$

b) Given the driving point impedance is $Z(s)=\dfrac{(s^2+1)(s^2+16)}{s(s^2+9)}$ synthesize the first and second foster forms for the impedance functions

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Code : 1G241

R-13

II B.Tech II Semester Regular Examinations May 2015

Electrical Machines-II

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)

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1. a) Derive the emf equation of single phase transformer? 6M
   b) A 1-ϕ Transformer has turns ratio of 440/110V takes a no-load current of 8A at 0.2 p.f lagging. If the secondary supplies a current of 200A at a p.f of 0.6 lagging, estimate the current taken by the primary. 8M
2. a) Derive the conditions for maximum efficiency of a single phase transformer? 6M
   b) A 100KVA, 50Hz, 1-ϕ transformer has 600 turns on primary and 80 turns on the secondary winding. The primary and secondary resistances are 0.35Ω and 0.02Ω respectively. And the corresponding leakage reactance's are 1.2Ω and 0.045Ω respectively. The supply voltage is 2000 V. Calculate i) Equivalent impedance referred to primary and (ii) the voltage regulation and the secondary terminal voltage for full load having a p.f of 0.9 lagging. 8M
3. a) Explain the principle and operation of autotransformer. 6M
   b) In a test for the determination of the losses of a 440V, 50Hz transformer, the total iron losses were found to be 3000W at normal voltage and frequency. When the applied voltage and frequency were reduced to half, the iron losses were found to be 850W. Calculate the eddy current loss at normal voltage and frequency. 8M
4. a) Explain the function and principle of operation of off-load and on-load tap changing transformers. 7M
   b) Explain how the harmonics can be suppressed using star/delta earthing transformer. Draw the relevant connection diagram. 7M
5. a) Induction machine is called a generalized transformer. Why? 6M
   b) A 4 pole, 3-ϕ Induction motor operates from a supply whose frequency is 50 Hz. Calculate
      i) The speed at which stator produced field rotates.
      ii) The speed of the rotor when the slip is 0.04
      iii) The frequency of the rotor current when the slip is 0.03
      iv) The frequency of rotor currents at standstill. 8M
6. a) Deduce the relation among rotor input power, mechanical power and rotor copper loss of 3-ϕ Induction motor. 6M
   b) A 3-ϕ, 50 Hz 8-pole, Induction motor has full load slip of 2%. The rotor resistance and standstill rotor reactance per phase are 0.06 Ω and 0.3 Ω respectively. Find the ratio of maximum full load torque and the speed at which the maximum torque occurs. 8M
7. Draw the circle diagram of a 7.4 KW, 400 V, 50 Hz, 3-ϕ slip-ring induction motor from the following data.No-load test reading: 400V, 6A, $\cos\phi_o$=0.085 Blocked rotor test reading: 100V, 12A, 730W The ratio of primary to secondary turns is equal to 2.8, stator resistance per phase is 0.86 Ω and of the rotor is 0.234 Ω. Calculate: i) full load current ii) full load slip iii) full load power factor iv) ratio of maximum torque to full load torque v) Maximum power magnitude. 14M
8. a) Explain cascade or concatenation or Tandem operation of speed control of Induction motor. 6M
   b) The rotor of a 3-ϕ slip ring induction motor has an induced voltage of 200V and impedance of 0.4+j2 Ω at standstill. The induction motor has full load slip of 0.04 driving constant torque load and running at 1440 rpm. Calculate the voltage to be injected if the motor is to be driven at i) 800 rpm ii) 1000 rpm. 8M

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Code : 1G243 **R-11**

II B.Tech II Semester Regular Examinations May 2015

Generation of Electric Power

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1.	a)	Draw the layout diagram of a typical steam power plant.	7M
	b)	Describe briefly about feed water and steam path	7M
2.	a)	What are the factors to be considered in setting up a Hydropower plant at a given site? Explain briefly	8M
	b)	Give the advantages and disadvantages of a hydro plant	6M
3.	a)	What is nuclear fission? Explain about chain reaction.	6M
	b)	Explain the functions of the following in a nuclear reactor i)Control rods ii) moderator iii)reflector iv)coolant	8M
4.	a)	Compare ac three phase three wire system with dc two wire system	5M
	b)	A 2-wire dc ring distributor is 300m long and is fed at 240V at point A. At point B 150m from A ,a load of 120A is taken and at C ,100m in the opposite direction a load of 80 A is taken. If the resistance per 100m of single conductor is 0.03Ω find i)current in each section of the distributor ii)Voltage at points B and C	9M
5.	a)	What is the difference in calculating voltage drop calculation in distribution systems when compared with transmission systems	2M
	b)	A single phase ring distributor ABC is fed at A. The loads at B and C are 40A at 0.8 p.f lagging and 60 A at 0.6 p.f lagging respectively. Both the power factors are referred with respect voltage at point A. The total impedance of sections AB, BC and CA are 2+j1, 2+j3, 1+j2 ohms respectively. Determine the current in each section.	12 M
6.	a)	Give the comparison between indoor and outdoor substations	5M
	b)	Explain Main and transfer and ring main bus bar systems .Give the advantages and disadvantages of each	9M
7.	a)	What is Tariff? Explain Two part and Three part tariffs and give advantages and disadvantages of both tariffs	7M
	b)	A generating station has a maximum demand of 50MW.Calculate the cost per unit generated from the following data. Capital cost: Rs 120 crores, Maintenance cost:20 crores, Interest and depreciation12%. Annual load factor 40%.	7M
8.	a)	What do you mean by most economical power factor? Show that the most economical power factor depends upon the relative costs of supply and power factor correction equipment.	7M
	b)	A consumer is taking a load of 20kW at power factor 0.8 lagging. (i)Find the rating of the capacitor required to raise the power factor to 0.95 lagging (ii) If a phase advancing device is used which takes current at leading power factor of 0.1, find the rating of the device.	7M

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