

**College of Engineering, Pune.**  
 (An autonomous Institute of Government of Maharashtra.)  
**End semester Examination**  
**(EE-101) Elements of Electrical Engineering.**  
**Semester - I**

Year: First Year  
 Academic Year: 2006-07  
 Duration: 3 Hours.  
 Instructions:

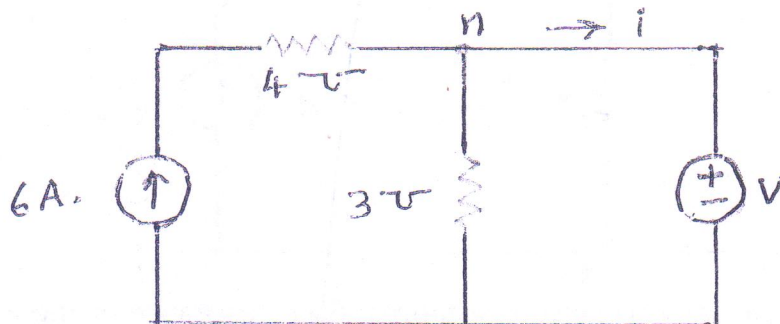
Branch: all branches.  
 Date: 27-11-2006  
 Max. Marks: 60

- (i) All questions are compulsory.
- (ii) Figures to the right indicate full marks.
- (iii) Assume suitable data if necessary.

**Q.1 A:** Find the current in a region when the total charge in the region is described by function: (5)

- (a)  $q(t) = 4e^{-2t}$
- (b)  $q(t) = 3\sin\pi t$
- (c)  $q(t) = 3\cos 2\pi ft$
- (d)  $q(t) = 5e^{-2t} \cos 3t$

**Q.1 B:** For the circuit shown below find 'i' when, (5)  
 (a)  $V = 1V$ . (b)  $V = 2V$  (c)  $V = 3V$



**Q1 C:** If  $\alpha_1$  is the resistance temperature coefficient of a material at a temperature  $t_1^\circ\text{C}$  and it is  $\alpha_2$  at  $t_2^\circ\text{C}$  then prove that  $t_2 - t_1 = (\alpha_1 - \alpha_2) / (\alpha_1 \cdot \alpha_2)$  (5)

(OR)

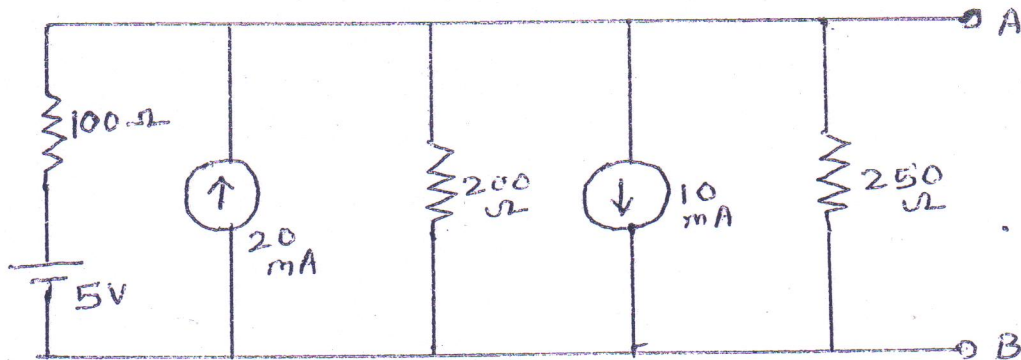
**Q.1 A:** A load of 0.866 lagging power factor draws 10 Amp, when connected across 100 V., 50 Hz supply. Find values of impedance, resistance and reactance. Write the equations for instantaneous values of voltage and current in the circuit. Take voltage as a reference. (4)

Q.1 B: Three identical resistors of 20 ohm are connected in star to a 415 V., (8)  
 Three-phase, 50 Hz, AC Supply.

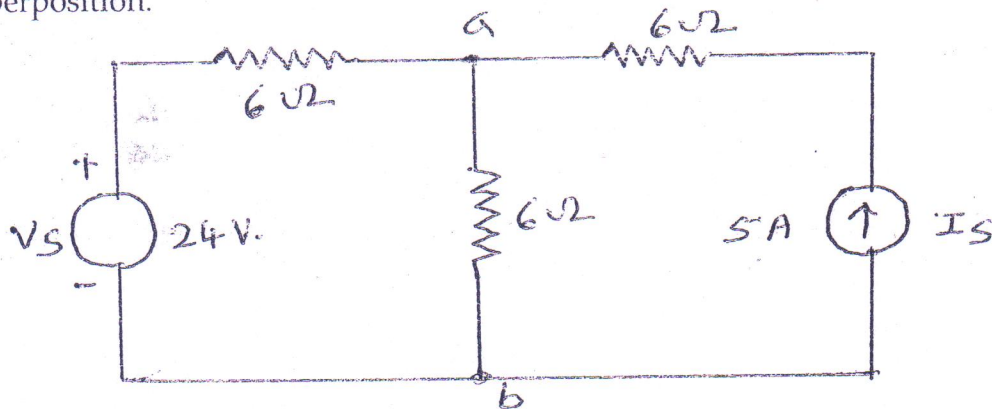
- (a) Calculate total power taken by the load.
- (b) Calculate the power consumed in the resistors if they are connected in delta.
- (c) If one of the resistors is open circuited, calculate power consumed in each case (star and delta).

Q1 C: Draw only diagram of ideal transformer. What assumptions are made in ideal transformer? (3)

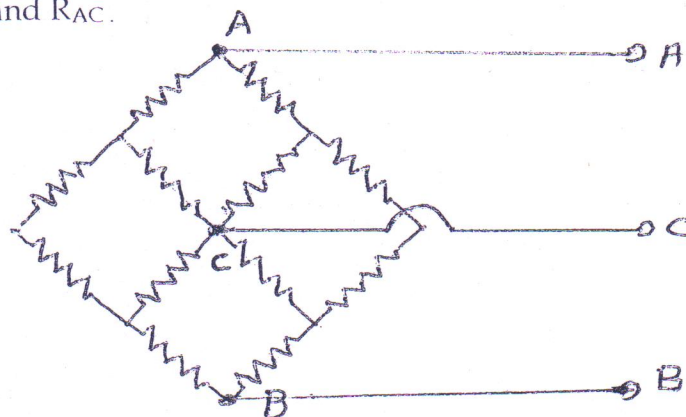
Q.2 A: For the circuit shown below find out equivalent current source for entire circuit. (5)



Q2 B: Determine current I through  $R_{ab}$  in the network shown below by the principle of superposition. (5)



Q.2 C: Fig. given below shows a mesh of resistances. Each resistance of the mesh is R ohms. Determine  $R_{AB}$  and  $R_{AC}$ . (5)

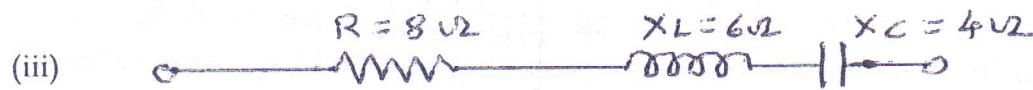
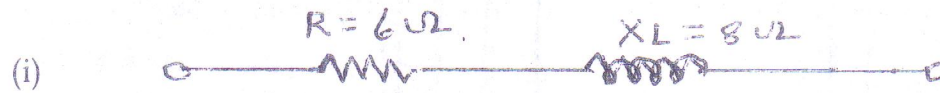


(OR)

Q.2 A: Define the terms:

(a) Cycle (b) Frequency (c) RMS value (d) form factor (e) Peak factor. (5)

Q.2 B: Express the impedances of following circuits in complex form and find its magnitude as well as phase angle. What will be the nature of power factor of each circuit? (6)



Q.2 C: Derive an expression for the energy stored in a capacitor. (4)

Q.3 A: It is required to produce a flux of 2 mWb. in the air gap of a cast steel ring of mean diameter 35 centimeters and cross sectional area of 4cm.x 4cm. Calculate the total ampere-turns required, if the length of air gap is 4 mm. and permeability of cast steel is 900. (5)

Q.3 B: Show that the hysteresis loss in a specimen of iron when it is taken through a complete cycle of magnetization is proportional to the area of the hysteresis loop. (5)

Q.3 C: Explain briefly the action of a transformer and show that the voltage ratio of the primary and secondary winding is the same as the turns ratio. (5)

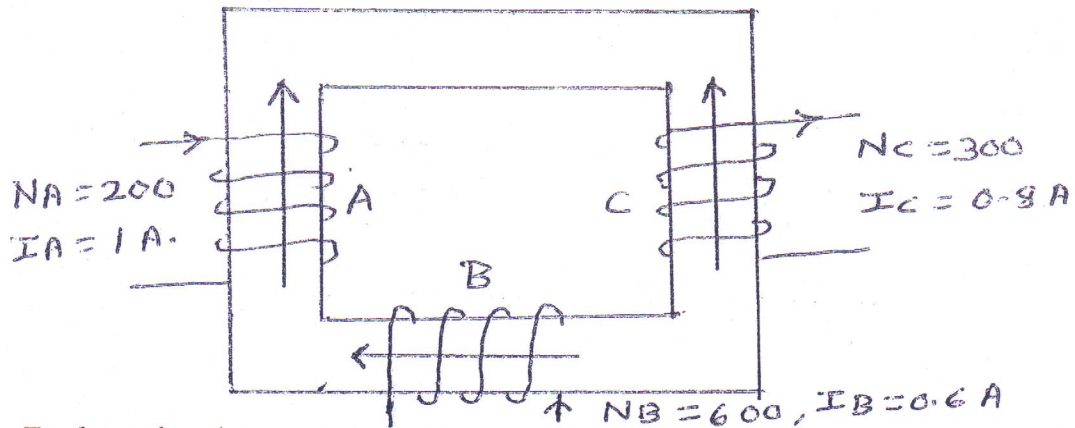
(OR)

Q.3 A: Explain with neat sketch working of auto-transformer. What are the advantages and disadvantages of an auto-transformer? (5)

Q.3 B: Define regulation and efficiency of a transformer.

A single phase transformer delivers 10 Amp. at 220 V to a resistive load while the primary draws 6 Amp. at 0.9 lagging power factor from 450 V, 50 Hz. Supply. Turns ratio of the transformer is 2. Calculate efficiency and regulation under this condition. (5)

- Q.3 C: (i) Define the terms: a) mmf b) reluctance c) permeability d) flux density (2)  
 (ii) Determine the total mmf acting in the magnetic circuit shown in fig. below. (3)



Q.4 A: Explain the three modes (rotating, generating and braking) of operation of a rotating electric machine with the help of neat diagrams. (5)

- Q.4 B: (i) Draw only the power flow diagram of an induction motor. (3)  
 (ii) List out the various applications of single phase induction motor. (2)

Q.4 C: Draw the schematic diagrams for all types of D.C. generators. Mention three generator characteristics and draw it for separately excited generator. (5)

\*Best of Luck\*