

**COLLEGE OF ENGINEERING**  
(Formerly Government College of Engineering, Pune)

Test: END SEMESTER EXAM

**(EE 101) Basic Electrical Engineering**

Programme: FY.B.Tech  
Year: 2009-10  
Duration: 3 Hrs.

Dates: 8/12/2009  
Max. Marks: 50

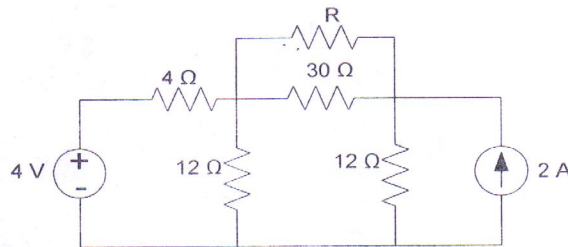
**Instructions:**

1. Solve all questions.
2. Figures to right indicates full marks
3. Draw neat figures wherever required
4. Assume suitable data, if necessary

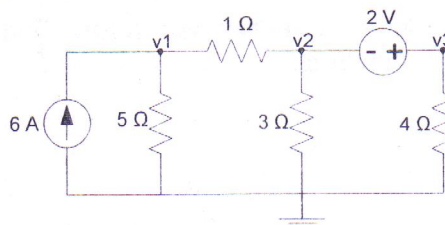
Marks

Q.1

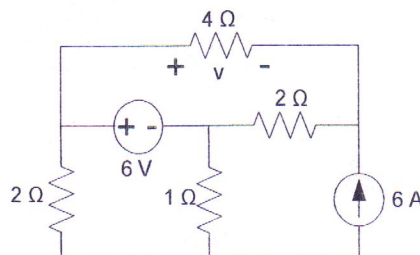
- a) A circuit is shown in figure given below. Determine the Thevenin's equivalent as seen by the resistance 'R'. Estimate the value of 'R' for maximum dissipation in it and the value of this power. All resistance values are in ohm. (04)



- b) Find the node voltages for the circuit shown below. (03)



- c) Apply Superposition theorem to the circuit given below and find 'v'. (03)



Q2

- a) For the circuit shown in figure (A),  $i(t)$  is described by the function given in figure (B). Sketch (i)  $v(t)$ , (ii)  $W_L(t)$ , (iii)  $P_R(t)$ , (iv)  $i_R(t)$  and (v)  $i_S(t)$ . (2.5)

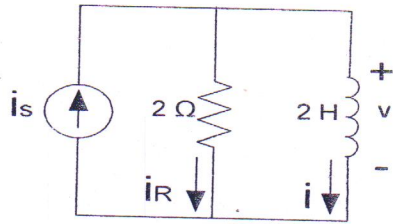


Fig.(A)

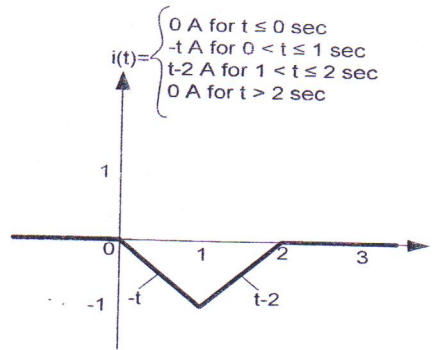
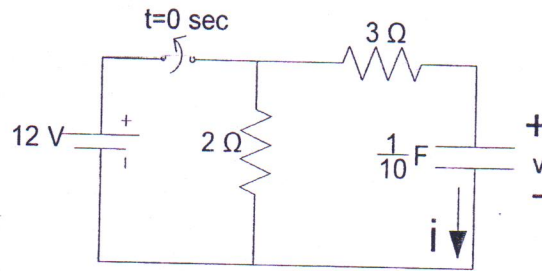
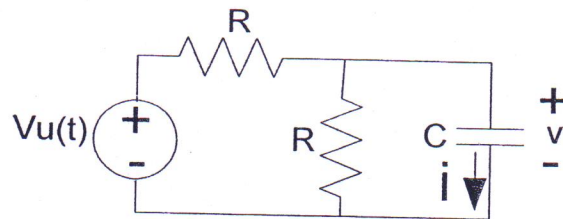


Fig.(B)

- b) For the circuit shown in figure given below, the switch opens at time  $t = 0$  s. Write a differential equation in  $v(t)$  for  $t \geq 0$  s. Find  $v(t)$  and  $i(t)$  for all time and sketch these functions. (3.5)



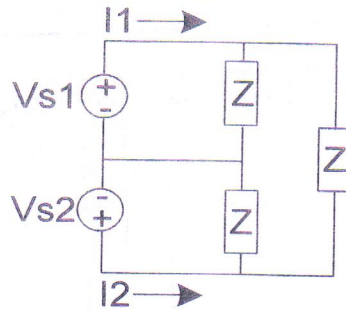
- c) For the circuit shown in figure given below, find the step responses  $v(t)$  and  $i(t)$  and sketch these functions. (04)



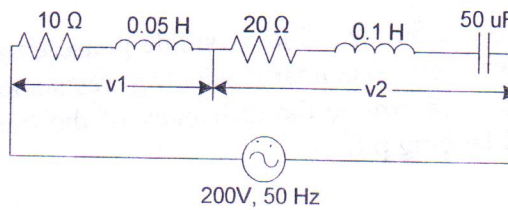
**Q3 Solve any two of the following**

10

- a) For the circuit shown below, find the currents  $I_1$  and  $I_2$  when  $V_{s1} = 250\sqrt{2}\angle -30^\circ V$ ,  $V_{s2} = 250\sqrt{2}\angle -90^\circ V$  and  $Z = 78 - j45\Omega$



- b) In the circuit given below, find (i) Values of  $v_1$  and  $v_2$ . (ii) Current (iii) p.f. of the circuit.



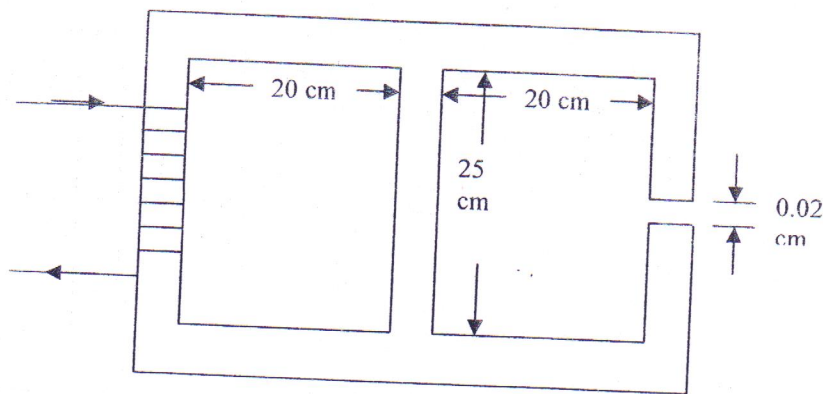
- c) Three similar coils connected in star draw a total power of 1.8 kW at 0.25 lagging from a 400 V, 3 phase, 50 Hz supply. Calculate the resistance and inductance of each coil. Draw the phasor diagram showing line and phase values of voltages and currents.

**Q4 Solve any two of the following**

- a) (i) An iron ring of the circular cross sectional area of  $3.0\text{cm}^2$  and mean diameter of 20 cm is wound with 500 turns of wire and carries a current of 2.09 A to produce the magnetic flux of 0.5 mWb in the ring. Determine relative permeability of the material. (2.5)
- (ii) If a current of 5 A flowing in coil with 1000 turns wound on a ring of ferromagnetic material produces a flux of 0.5 mWb in the ring. Calculate (i) self inductance of coil (ii) e.m.f. induced in the coil when current is switched off and reaches zero value in 2 millise. (iii) mutual inductance between the coils, if a second coil with 750 turns is wound uniformly so as to have 100 % flux linkage. (2.5)



- b) The core shown in following figure has a relative permeability of 4000. (05)  
Magnetic core has uniform cross sectional area and is given as  $4 \times 4 \text{ cm}^2$ . The central limb is required to carry a flux of  $0.01 \text{ Wb}$ . Find the current needed for exciting the coil. Neglect fringing effect.



- c) A 3300/110 V, 50 Hz, 60 kVA single phase transformer has iron losses of 600 W. Primary and secondary winding resistances are  $3.3 \Omega$  and  $0.011 \Omega$  respectively. Determine the efficiency of the transformer on full load and half load at 0.8 lagging p.f. (05)

Q5

a) Answer the following

- (i) In a residential house, the following loads are connected: (2.5)

- (a) Ten lamps of 40 W each, switched on for six hours a day.  
(b) Three fans of 100 W each, switched on for 12 hours a day.  
(c) One water heater of 1 kW is switched on for one hour per day.  
(d) One refrigerator of 200 W working for 12 hours per day.

If each unit of energy costs Rs. 3.40, what will be the total cost in the month of August?

- (ii) Explain the principle of operation of 'autotransformer' (1.5)

b) Answer any two of the following (06)

- (i) With the help of a neat diagram, explain construction of DC machine.  
(ii) Explain the principle of operation of 3 phase Induction Motor.  
(iii) If the applied voltage is sinusoidal, show that average power absorbed by an inductor over a complete cycle is zero.

\*\*\*\*\*Best of Luck\*\*\*\*\*