ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER – 2007

CIRCUIT THEORY & NETWORKS

SEMESTER – 3

EIE

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) A four terminal network constitute a

a) one port network b) two port network

c) four port network d) none of these. ☐

ii) A capacitor C at time $t = 0 +$ with zero initial change acts as a

a) short circuit b) open circuit

c) current source d) voltage source. ☐

iii) Kirchhoff's law fail in case of

a) Linear networks

b) Non-linear networks

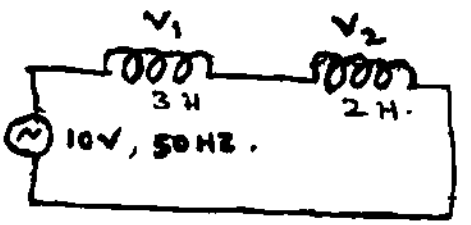
c) Dual networks

d) Distributed parameter networks. ☐

iv) The voltages v_1 & v_2 in the given circuit are

a) 6v, 4v b) 4v, 6v

c) 5v each d) none of these. ☐



xi) What is the phase angle between inductor current & the applied voltage in a parallel RL circuit ?

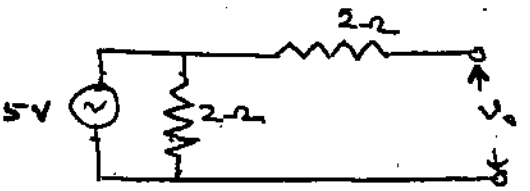
a) 0° b) 45°

c) 90° d) 30°. ☐

xii) Thevenein's equivalent resistance of the given circuit is

a) 2Ω b) 0Ω

c) 1Ω d) α. ☐

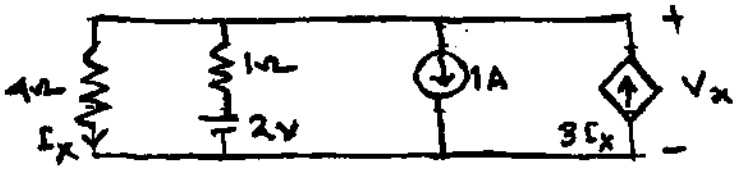


GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Determine the value of I_x & V_x.

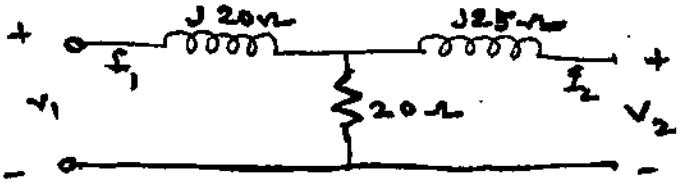


3. a) What is linear time invariant system ?

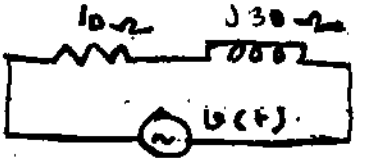
b) What is impulse response ?

c) The response of a system is given by $y(t) = c \times (t) + x^3(t)$. State whether the system is time-invariant as time-variant.

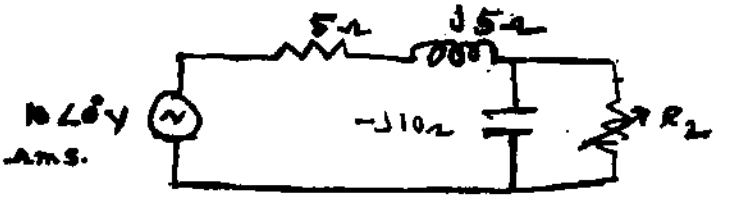
4. Determine the *Z*-parameter of the network shown in the *fig.* Is it a reciprocal network ?



5. In the circuit shown below, a voltage v (t) = 50 sin (wt + 30°) is applied. Determine the true power, reactive power & power factor.



6. In the network shown below, find R_L which will dissipate maximum power. Determine also maximum power.



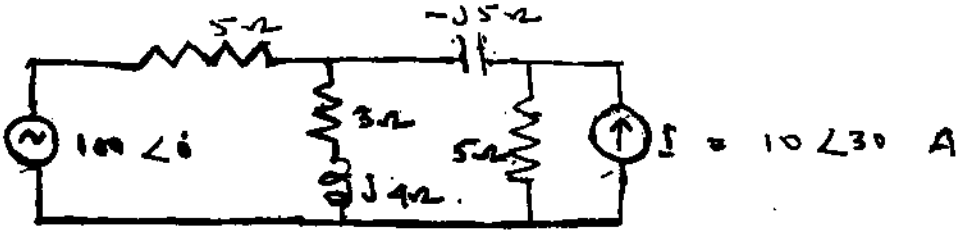
GROUP – C

(Long Answer Type Questions)

Answer any *three* questions. $3 \times 15 = 45$

7. a) State & explain superposition theorem.

   b) Find using superposition theorem, the current through the capacitor having reactions – $j5\ \Omega$.



5 + 10

8. a) Describe the method of measuring reactive power.

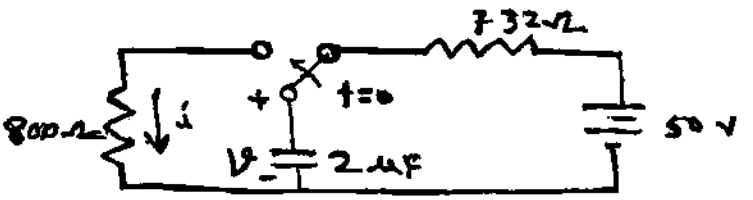
   b) A three phase delta connected RYB system with effective voltage of 400 V, has a balanced load with impedance 3 + $j4\Omega$. Calculate

   i) phase current

   ii) line current

   iii) power in each phase.

c) Determine $V(0^+)$, $i(0^+)$, $i(2\text{ ms})$ for the following circuit :

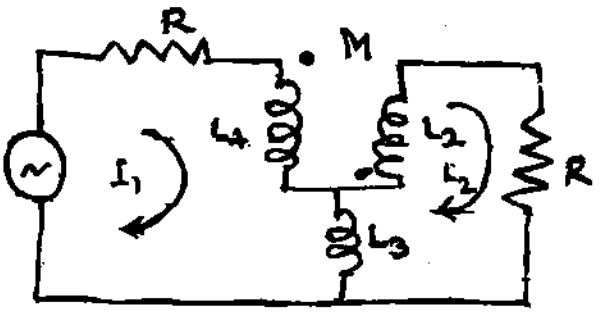


5 + 5 + 5

9. a) Determine for a two-port network the condition of reciprocity & condition of symmetry in terms of *h*-parameters.

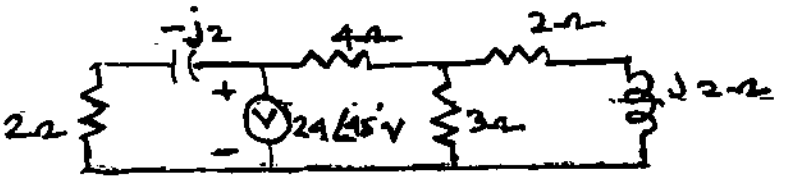
b) Draw the voltage phases & current phases of a series R-L circuit. Draw also the impedance triangle.

c) Find the ratio of I_1 & I_2 for the following circuit :



5 + 5 + 5

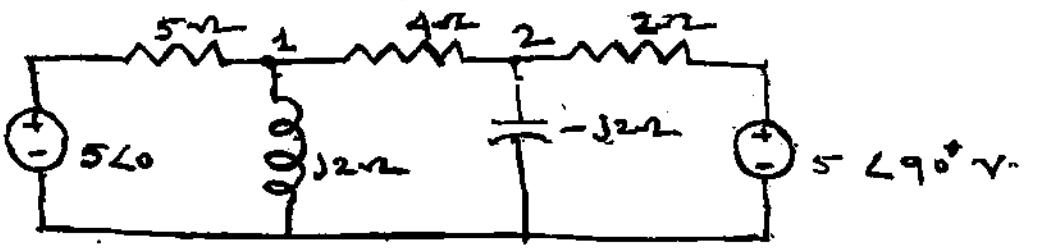
10. a) Determine current in 3Ω resistor in the following *figure* :



b) Find two elements of a series circuit having current $i = 4{\cdot}24 \cos(5000t + 45^\circ)$A, power 180 w & power factor 0·8 lagging.

c) An RLC series circuit has R = 100Ω, L = 500 mH & C = 40 μF. Calculate resonant, lower & upper half power frequency. 8 + 4 + 3

11. a) For the network shown, determine the node voltages.



b) Determine the step response of series R-L-C circuit. Draw the wave forms of the response.

c) Determine Q factor of a series R-L-C circuit. 5 + 7 + 3

END