5178

B.Sc. (Prog.) PHYSICAL SCIENCES/I Sem. B

Paper ELPT-101

Network Analysis

Time : 3 *Hours*   *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *five* questions.

All questions carry equal marks.

Use of calculator/logarithmic tables is permitted.

1.   (*a*)   Determine the average and r.m.s. value of a periodic current

given by :

$$I = I_0 \sin(100\pi t) \text{ for } 0 \le t \le 0.01s.$$ 6

(*b*)   Explain the differece between a.c., d.c. and unidirectional

current.   3

(c) Evaluate the sum of voltages given by :

$$V_1 = 120 \cos(\omega t + 60°)$$

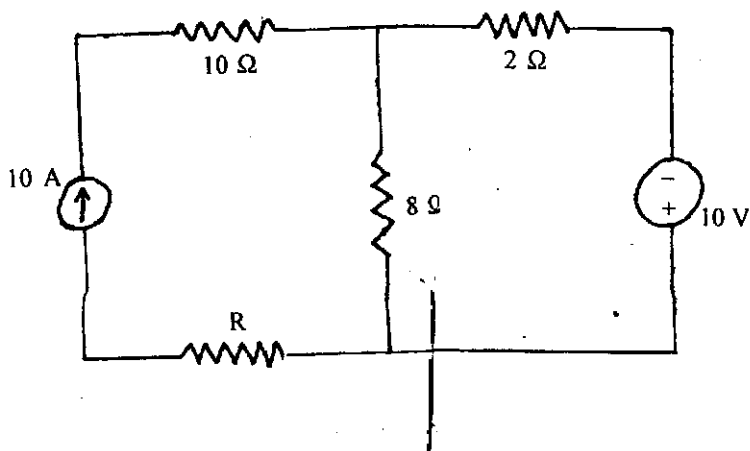and $V_2 = 120 \sin(\omega t + 30°)$.   3

(d) Calculate the following and give answer in polar form :

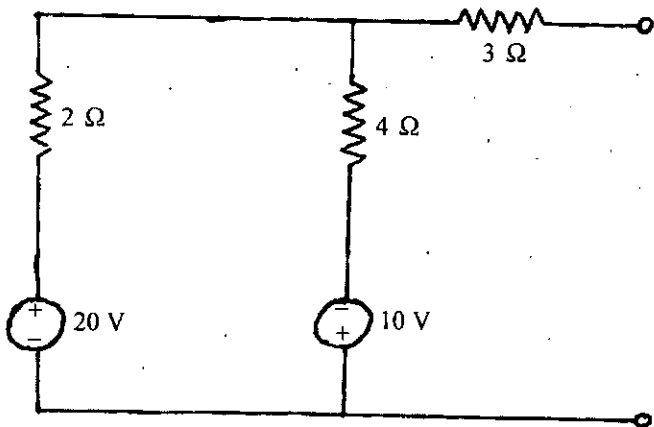$$V = (3 + 4j)(4 - j).$$ 3

2. (a) State and explain superposition theorem.   8

(b) Determine current through 8 Ω resistance. Does your
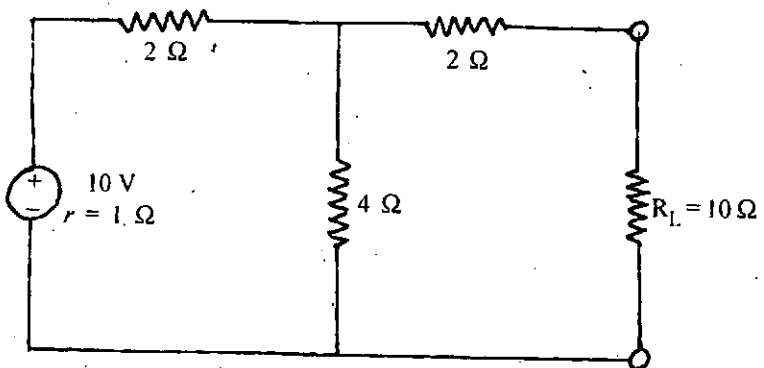
answer depend on the value of R ?   7

3.   (a)   State Thevenin's theorem. Obtain Thevenin equivalent

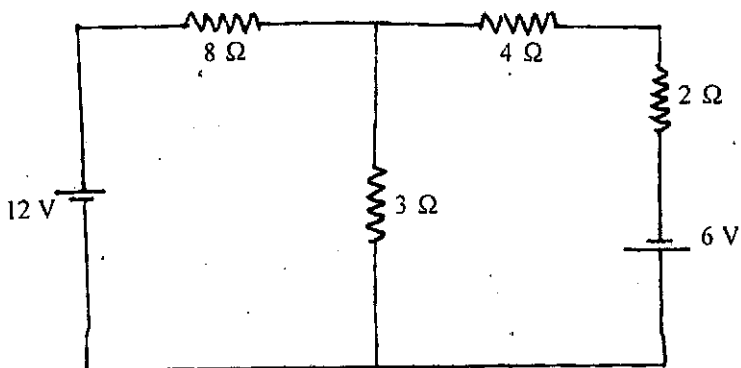circuit for the following network :   7

(b)   State Norton's theorem. Obtain Norton equivalent

of the circuit given below and also determine current

in R_L.   8

4.   (a)   In the following circuit write mesh current equations
           and evaluate current in each element. Redraw a circuit
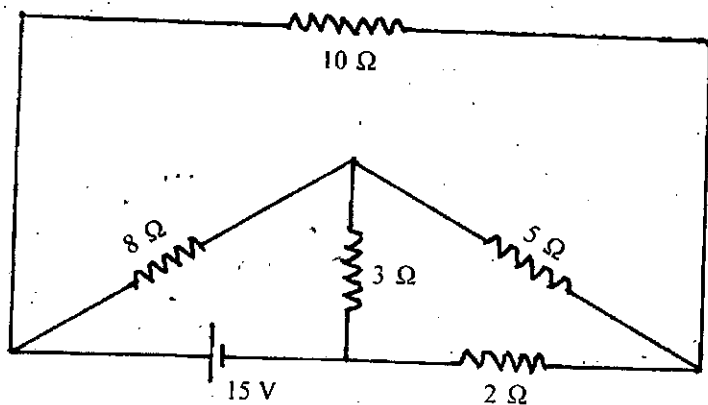   with currents labelled of each element.   10
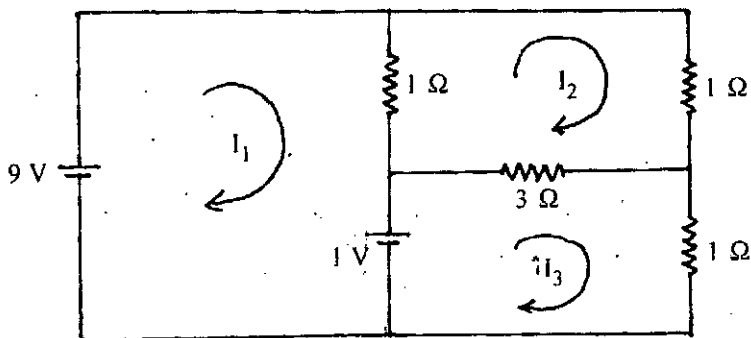
     (b)   For the circuit given below, write node voltage equation
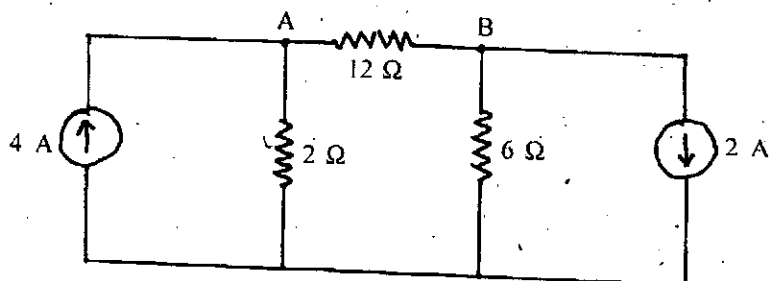   and determine current in each branch.   5

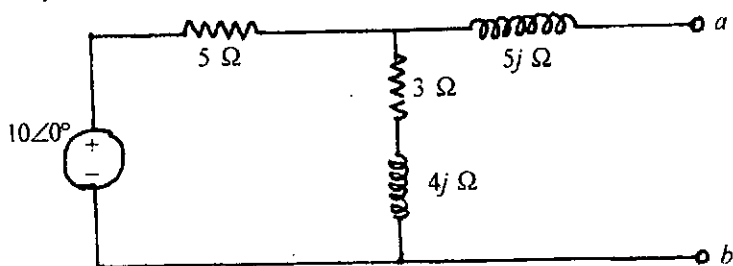5. (a) What is the power loss in 10 Ω resistance in the following network ? 8

(b) Determine direction and magnitude of current in 12 Ω resistance in the following network : 7

6. (a) Replace the following active network at terminals a, b

with a Thevenin equivalent.   7

(b) In ideal L and C individually connected in series to

an a.c. source find the expressions for current and

hence show that current leads and lags the applied
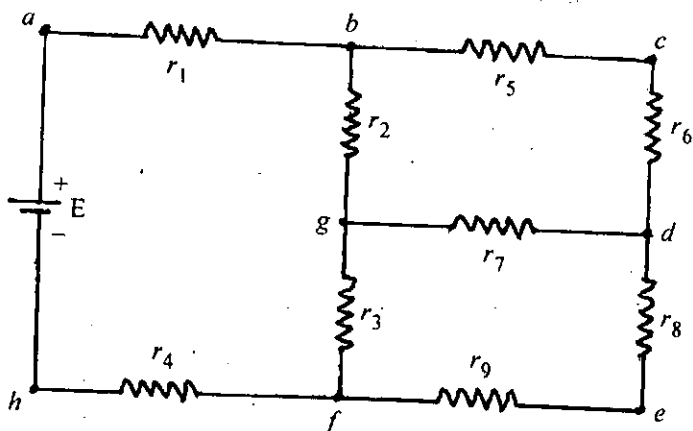
voltage by $\pi/2$.   4

(c) In the following circuit identify :   4

(i) nodes

(ii) junctions

(iii) branches

(*iv*)   meshes.

7.   (*a*)   In a series L-R circuit under transient conditions find the

expression of current under :

10

(*i*)   Growth of current and

(*ii*)   Decay of current conditions.

(*b*)   Derive the expression for energy stored in the

capacitor for a ideal series RC circuit under transient

conditions.

5

8. (a) In a parallel LCR circuit with a.c. source show that

minimum current flows at resonant frequency.   10

(b) In a series RC circuit with a.c. source find the expression

for current.   5