



5. Show the waveform representation of applied voltage across inductor, and the resulting current and the power.
6. A voltage of  $240 \sin 377t$  is applied to a  $6\ \Omega$  resistor. Find the instantaneous power and average power.
7. Calculate the impedance at resonance for an RLC series circuit, having  $R = 20\ \Omega$ ,  $L = 50\ \text{mH}$ , and  $C = 1\ \mu\text{F}$ .
8. An RC series circuit has  $R = 20\ \Omega$  and  $C = 400\ \mu\text{F}$ . What is its time constant?
9. Two  $2\ \text{H}$  inductance coils are connected in series and are also magnetically coupled to each other, the coefficient of coupling being  $0.1$ . Find the total inductance of the combination.
10. List the properties of incidence matrix.

PART B — ( $5 \times 13 = 65$  marks)

11. (a) (i) Determine the potential difference across A and B,  $V_{AB}$  in the circuit shown in Fig. 3. (9)

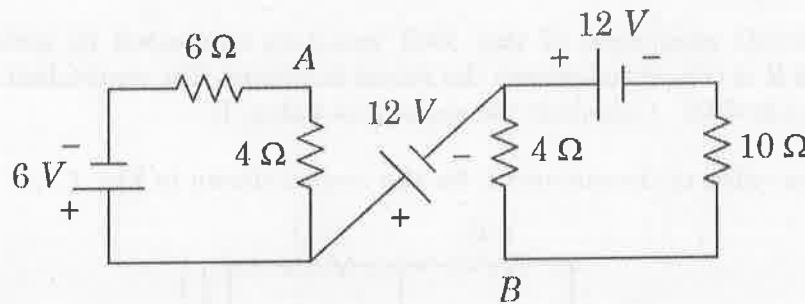


Fig. 3

- (ii) Calculate the equivalent resistance between the terminals A and B of circuit shown in Fig. 4. (4)

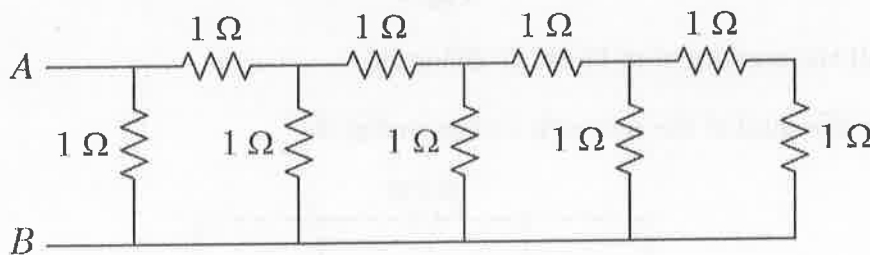


Fig. 4

Or

- (b) (i) Determine the voltage drop across all the resistances for the circuit shown in Fig. 5. using nodal analysis (6)

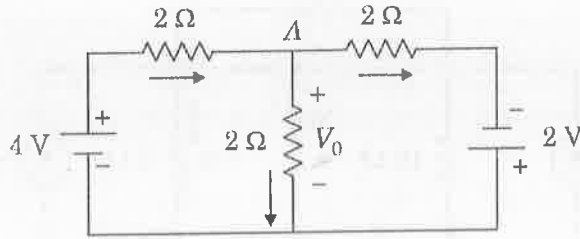


Fig. 5

- (ii) Determine the current passing through  $15\ \Omega$  resistor in the circuit shown in Fig. 6 using mesh analysis. (7)

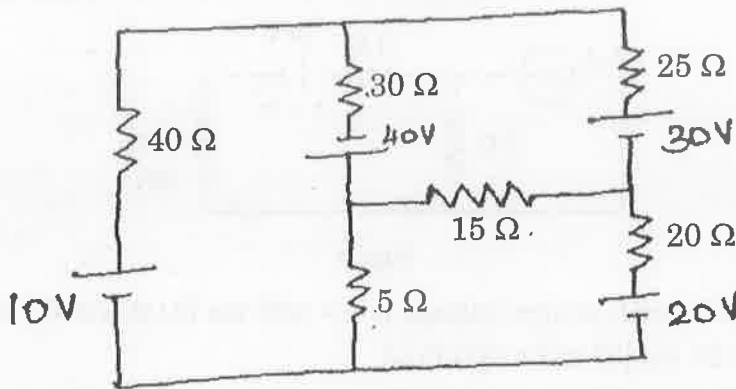


Fig. 6

12. (a) Determine the value of  $R_L$  for maximum power transfer in Fig. 7. Also find the maximum power.

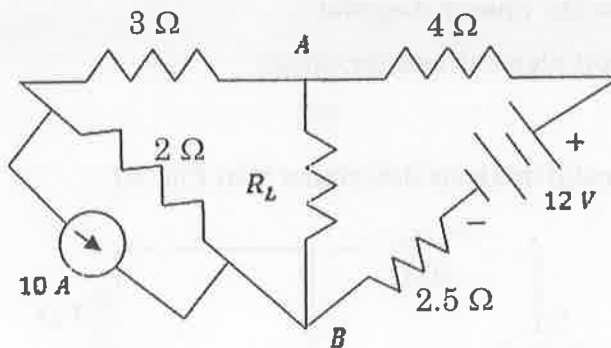


Fig. 7

Or

- (b) (i) Determine  $i_x$  for the following network shown in Fig. 8. (7)

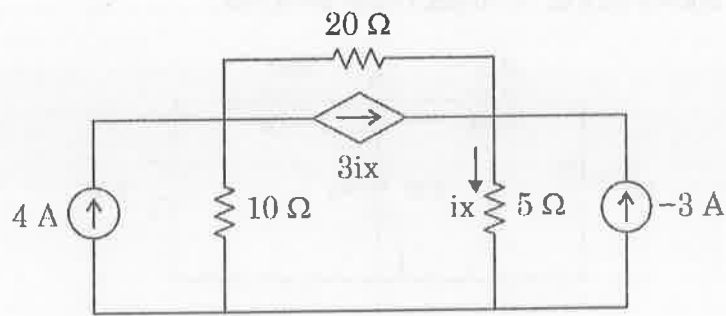


Fig. 8

- (ii) Using Thevenin's theorem, Calculate the power loss in  $R_L$  in Fig. 9. (6)

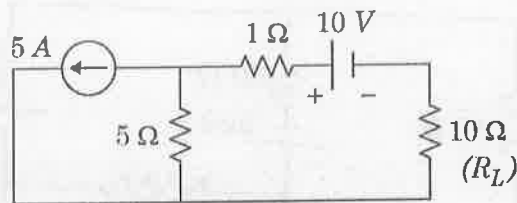


Fig. 9

13. (a) In the circuit, source voltage is  $v = 200 \sin [314t + (\pi/6)]$  and the current is  $i = 20 \sin [314t - (\pi/3)]$  Find
- frequency
  - Maximum values of voltage and current
  - RMS value of voltage and current
  - Average values of both
  - Draw the phasor diagram
  - Circuit element and its values

Or

- (b) (i) By nodal analysis determine  $V$  in Fig. 10. (6)

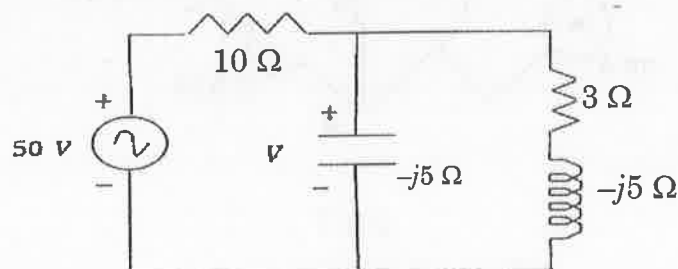


Fig. 10

- (ii) For the network shown in Fig. 11, Calculate the voltage across  $7\ \Omega$  using Nortons theorem. (7)

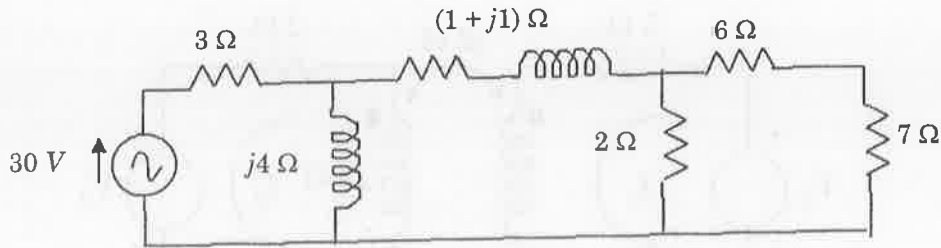


Fig. 11

14. (a) (i) Show that  $\omega_1 \omega_2 = \omega_r^2$  for a series resonant circuit. (6)
- (ii) A coil has a resistance of  $20\ \Omega$  and inductance of  $80\ \text{mH}$  and is connected in series with a  $100\ \mu\text{F}$  capacitor across  $200\ \text{V}$ ,  $50\ \text{Hz}$  supply, Determine the resonant frequency. Also determine, at resonance, the circuit impedance and BW. (7)

Or

- (b) (i) Examine the transient response of RC series circuit for unit step input. (6)
- (ii) In the circuit of Fig. 12, the switch S has been in position 1 for sufficient time to establish steady-state conditions. The switch is then moved to position 2. Determine the current transient.

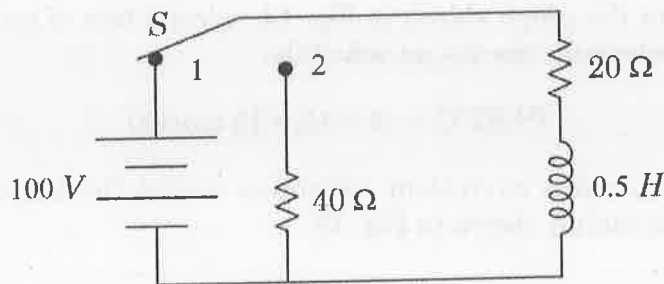


Fig. 12

15. (a) (i) Two identical coupled coils have an equivalent inductance of  $80\ \text{mH}$  when connected series aiding, and  $35\ \text{mH}$  series opposing. Calculate the self inductance of the coils, mutual inductance between them, and coefficient of coupling. (6)

- (ii) For the coupled circuit shown in Fig. 13, Show the ratio  $V_2/V_1$  which results in zero current  $I_1$ .

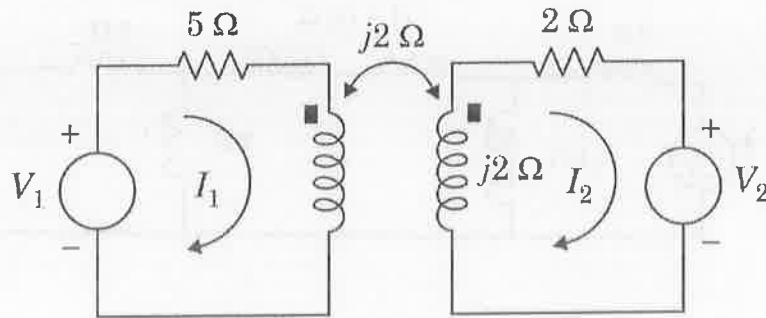


Fig. 13

Or

- (b) (i) The oriented graph of a network is shown in Fig. 14. Obtain the incidence matrix. (5)

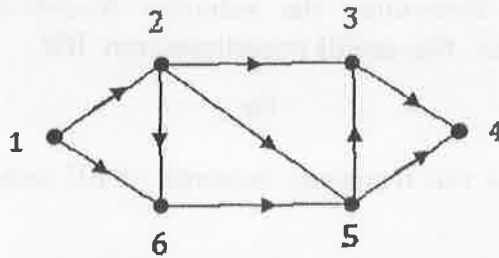


Fig. 14

- (ii) For the graph shown in Fig. 14, select a tree of your own choice and Determine the tie-set schedule. (8)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Determine equivalent resistance across the terminals  $a$  and  $b$  for the circuit shown in Fig. 15. (8)

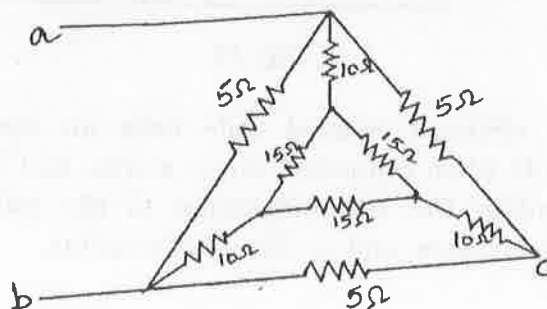


Fig. 15

- (ii) Find the voltage across the  $2\Omega$  resistor by using superposition theorem for the circuit shown in Fig. 16. (7)

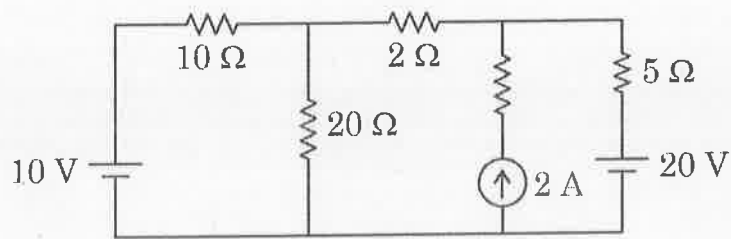


Fig. 16

Or

- (b) Analyze the transient response of RLC Series circuit for sinusoidal excitation.