B.Tech. / B.E. Instrumentation Engineering (Model Curriculum) Semester-III

305 / IN305M - Network Theory

P. Pages : 4 **GUG/W/23/14013**

Time : Three Hours * 7 6 0 0 * Max. Marks : 80

Notes : 1. Same answer book must be used for each section.
2. An questions carry marks as indicated.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.

1. a) Write the mesh equations and determine mesh currents I_1, I_2 & I_3 for the circuit shown in fig. 1 (a). **8**

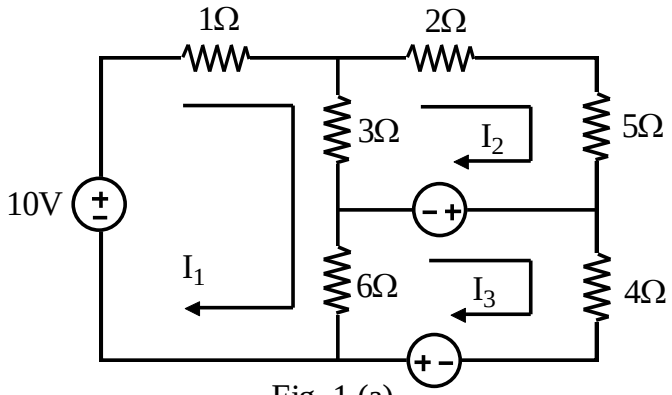

Fig. 1 (a)

b) Write the node equations and determine the currents in each branch for the network shown in fig. 1 (b) **8**

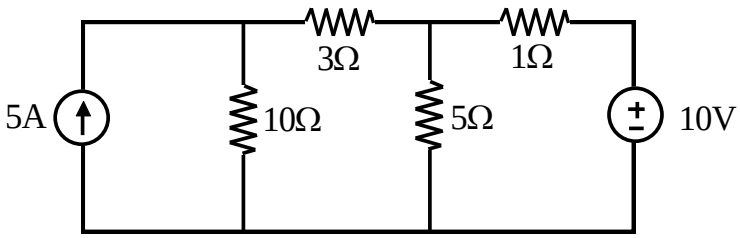

Fig. 1 (b)

OR

2. a) Find the current through the 10Ω resistor for the circuit shown in fig. 2(a) using mesh analysis. **8**

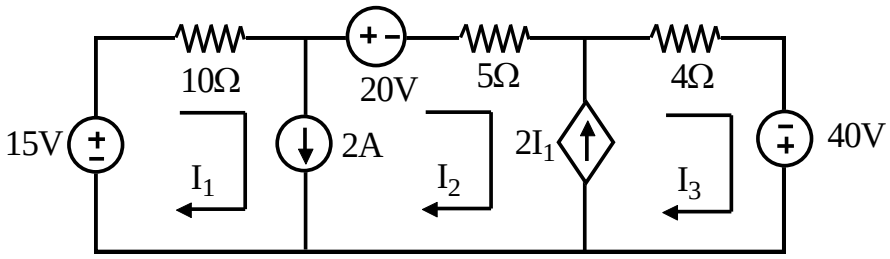

Fig. 2 (a)

b) Find the current passing through 5Ω resistor for the circuit shown in fig. 2(b) using nodal method. **8**

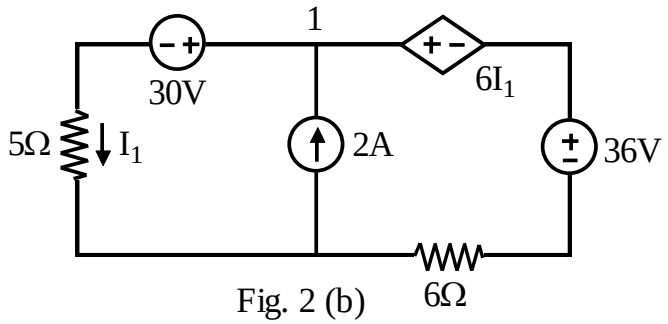

Fig. 2 (b)

3. a) Determine the maximum power delivered to the load in the circuit shown in fig. 3(a) **8**

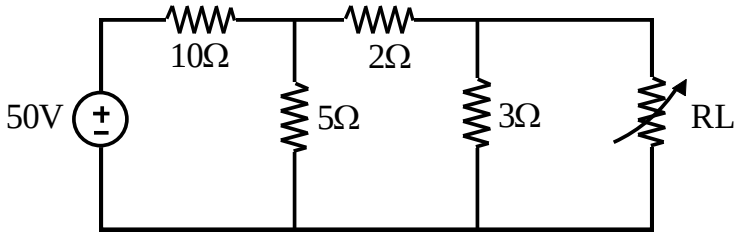

Fig. 3 (a)

b) Find the Thevenin's and Norton's equivalents for the circuit shown in fig. 3(b) with respect to terminal AB. **8**

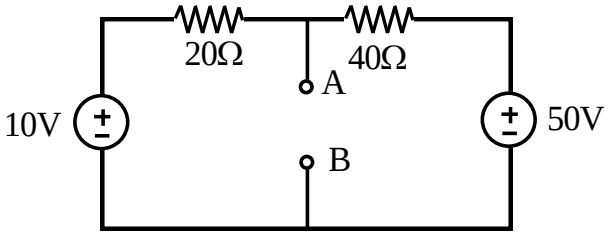

Fig. 3 (b)

4. a) Verify the reciprocity theorem for the circuit shown in fig. 4 (a) **8**

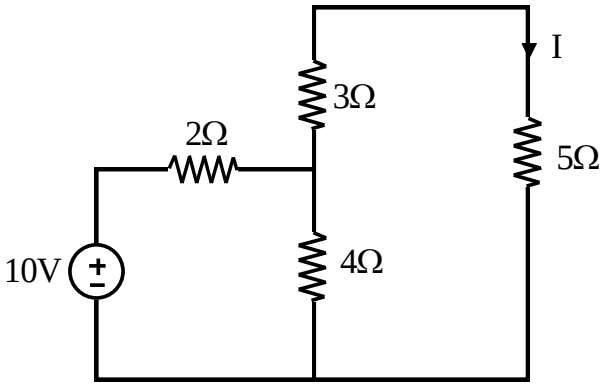

Fig. 4 (a)

b) State and derive the condition for maximum power transfer from source to load in d.c. circuits. **8**

5. a) Determine the complex impedance and impedance diagram for a series R-L circuit. **8**

b) Determine the total impedance Z_T, current I, phase angle θ, and voltage across each element in the circuit shown in fig. 5(b) **8**

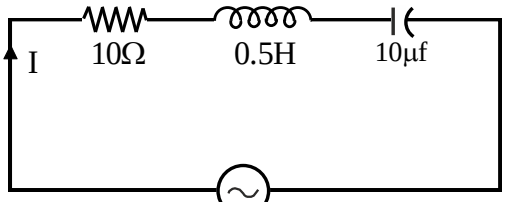

Fig. 5 (b)

OR

6. a) Define apparent power and power factor. A sinusoidal voltage $v = 50\sin\omega t$ in applied to a series RL circuit. The current in the circuit is given by $i = 25\sin(\omega t - 53^o)$. Determine: **8**

i) Apparent power ii) Power factor iii) Average power

b) Find out the complex impedance and impedance diagram for a series R-L-C circuit. **8**

7. a) Obtain the d. c. response of an R-C circuit shown in fig. 7(a). **8**

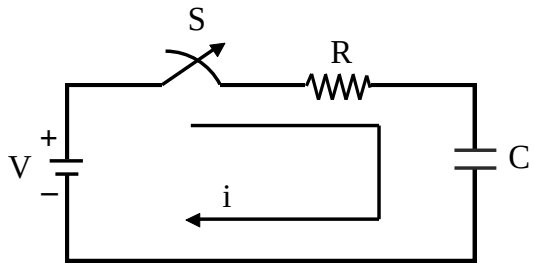

Fig. 7 (a)

b) Determine the current I, the voltage across resistor and the voltage across the inductor at t = 0 as shown in fig. 7 (b) **8**

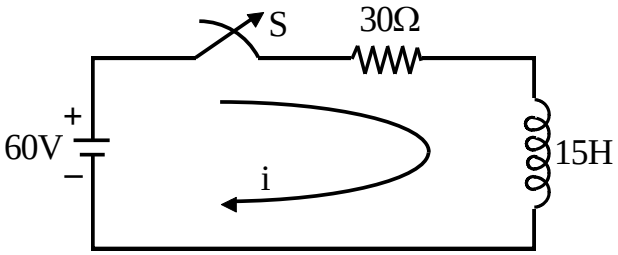

Fig. 7 (b)

OR

8. a) Determine the current expression i(t) for the circuit shown in fig. 8(a) when switch is moved from the position 1 to the position 2 at t = 0 and the switch is in position 1 for a long time. **8**

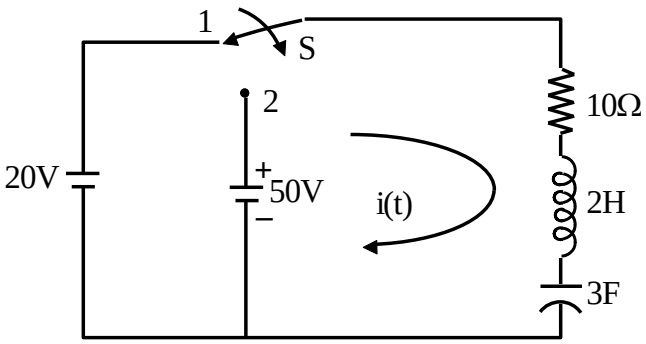

Fig. 8 (a)

b) Obtain the d.c. response of an R-L circuit shown in fig. 8(b). **8**

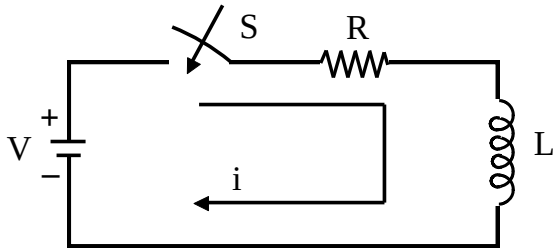

Fig. 8 (b)

9. a) Find the short circuit admittance parameters for the circuit shown in fig. 9(a) **8**

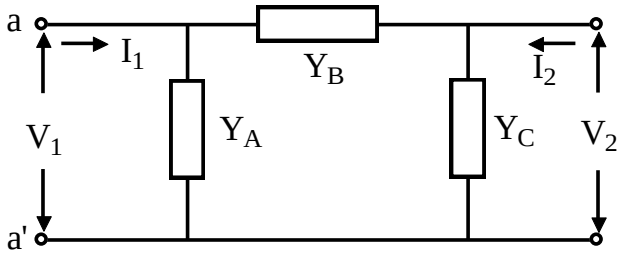

Fig. 9 (a)

b) Find the transmission parameters for the circuit shown in fig. 9(b). **8**

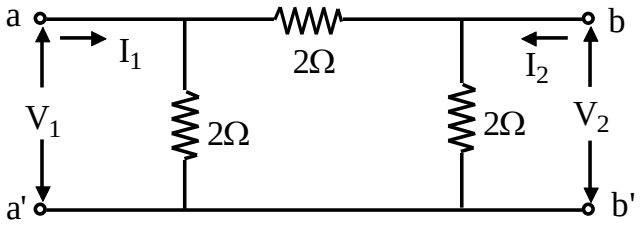

Fig. 9 (b)

OR

10. a) Find the h parameters for the circuit shown in fig. 10(a). **8**

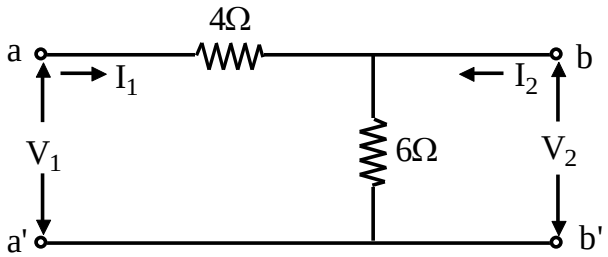

Fig. 10 (a)

b) Find the admittance matrix parameters Y_{11}, Y_{12}, Y_{21} & Y_{22} for a given $Z_{11} = 3\Omega,\ Z_{12} = 1\Omega,\ Z_{21} = 2\Omega$ & $Z_{22} = 1\Omega$. **8**

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