(3 Hours) **[Total Marks: 80**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Answer any **three** from the remaining **five** questions.
(3) **Assume** suitable **data** if necessary and justify the same.

1. Answer **any four**. **[20]**

(a) Define the terms oriented graph, tree and loop.

(b) Using Laplace transform, obtain the expression for current in impure inductor when a unit ramp signal is applied.

(c) Derive the condition for reciprocity in transmission parameters.

(d) State the various properties of LC driving point function.

(e) Using superposition theorem, find current I_x of network given in Fig.1

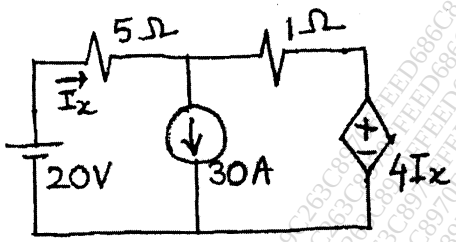

Fig. 1

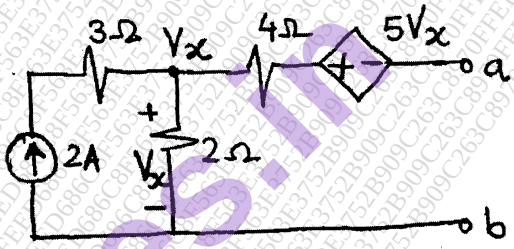

Fig. 2

Q2a Obtain Thevenin's equivalent of network shown in Fig. 2 **[8]**

Q2b For the graph shown in Fig. 3, write the tieset matrix and f-cutset matrix. **[8]**

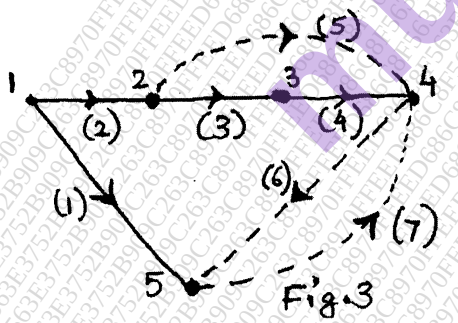

Fig. 3

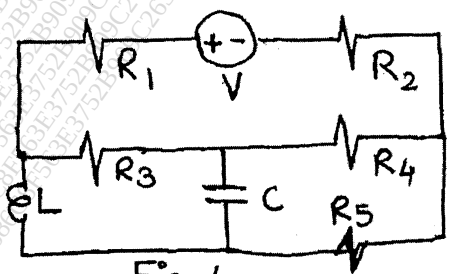

Fig. 4

Q2c Draw the dual of the network shown in Fig. 4 **[4]**

Q3a Explain the concept of super mesh and super node with an example. **[5]**

Q3b Write the mesh equations for the circuit shown in Fig. 5 **[5]**

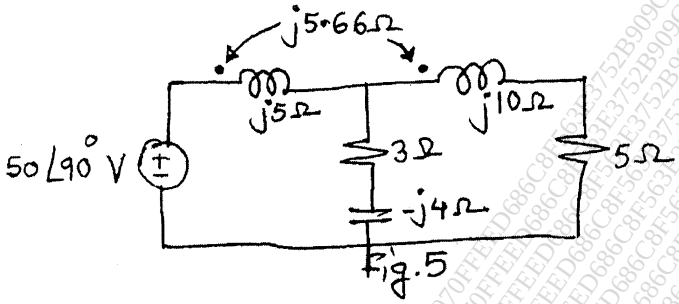

Fig.5

(c) For the network shown in Fig.6, steady state is reached with the switch closed. The switch is opened at t = 0. Obtain expressions for $i_L(t)$ and $v_L(t)$. **[10]**

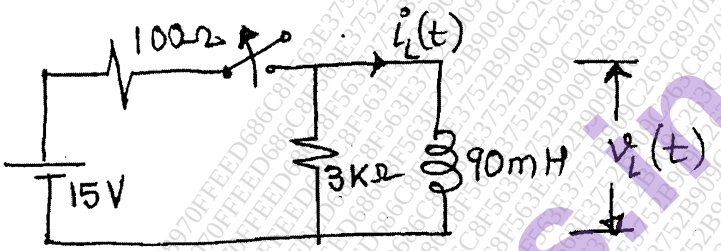

Fig. 6

Q4a Using differential method, derive the expression for current in a series RL circuit. Draw its characteristics and define time constant. **[6]**

Q4b Mention the restrictions on pole and zero locations for driving - point functions. **[4]**

Q4c Find the current I in the network shown in Fig.7, using superposition theorem **[10]**

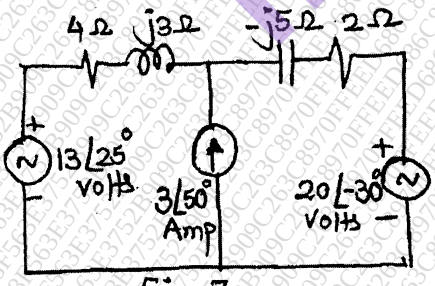

Fig. 7

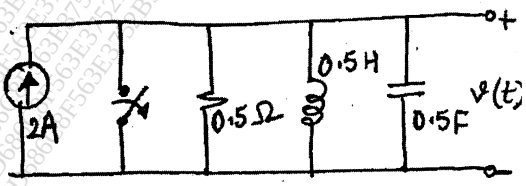

Fig. 8

Q5a The network shown in Fig.8 has acquired steady state at t < 0 with the switch closed. The switch is opened at t = 0. Determine v(t). **[10]**

Q5b For the network shown in Fig.9, find Z and h – parameters. **[10]**

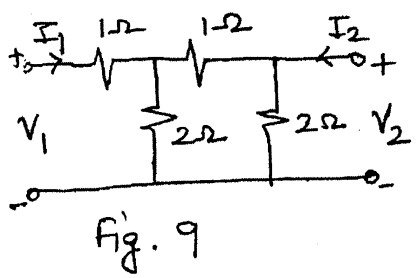

Fig. 9

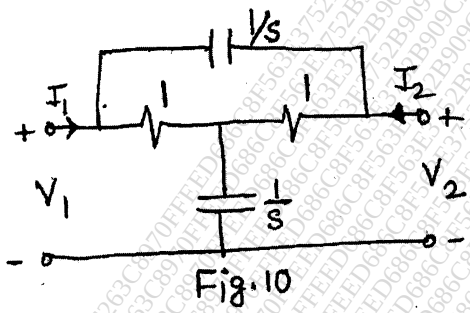

Fig. 10

Q6a Find the short circuit parameters for the network shown in Fig 10. **[10]**

Q6b The voltage V(s) of a network is given by $V(s) = \frac{3s}{(s+2)(s^2+2S+2)}$. Plot its pole – zero diagram and hence obtain v(t) using graphical method. **[10]**