DU – 114

III Semester B.E. (E&C) Degree Examination, Dec. 2017/Jan. 2018
(2K6 Scheme)
EE – 311 : ELECTRIC CIRCUITS AND ANALYSIS (EC)

Time : 3 Hours Max. Marks : 100

Instruction *: Answer* ***any five*** *questions, selecting atleast* ***two*** *from* ***each*** *Part.*

PART – A

1. a) i) What is an ideal voltage source ?
   ii) What is an ideal current source ? **4**

   b) Using nodal method determine the current through the resistance of 0.5 Ω connected between the nodes 1 and 2 in the network shown in the Fig. 1(b). **8**

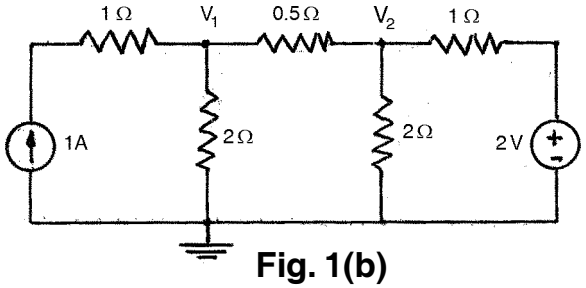

Fig. 1(b)

   c) Find E which results in zero current in (2 + j3) Ω branch of the circuit shown in Fig. 1(c) using Mesh current method. **8**

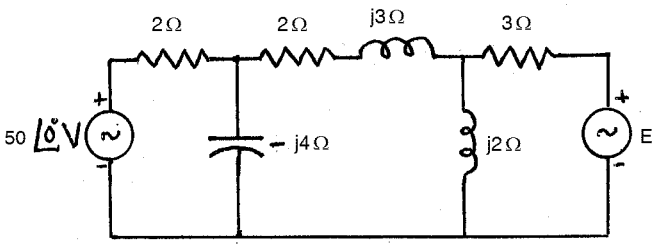

Fig. 1(c)

2. a) Explain dot convention in coupled circuits. **4**

   b) Find equivalent inductance at terminals 1 – 1′ of the network shown in Fig. 2(b). **8**

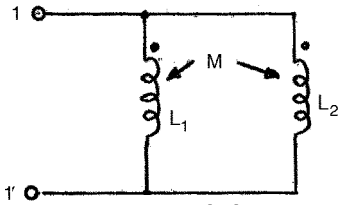

Fig. 2(b)

P.T.O.

c) Find the resistance between terminals A and B in the network shown in Fig. 2(c). **8**

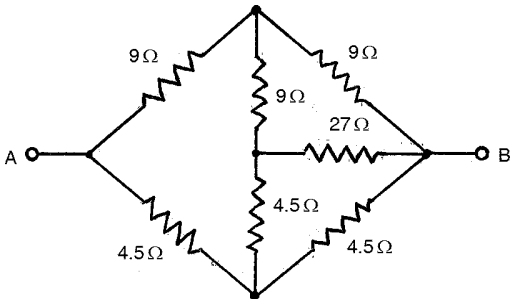

Fig. 2(c)

3. a) State and explain Thevenins theorem. **6**

b) Find the current I in the circuit shown in Fig. 3(b) using superposition theorem. **6**

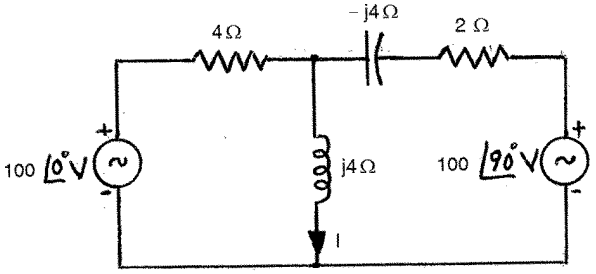

Fig. 3(b)

c) Find Z_L for a maximum power transfer to it and hence find maximum power transferred in the circuit shown in Fig. 3(c). **8**

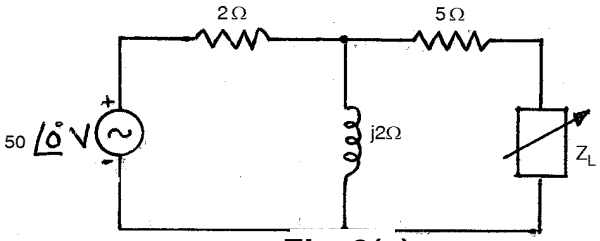

Fig. 3(c)

4. a) Show that the resonant frequency of a series RLC circuit is the geometric mean of half power frequencies. **6**

b) Determine the RLC parallel circuit parameters whose response curve is as shown in Fig. 4(b). **6**

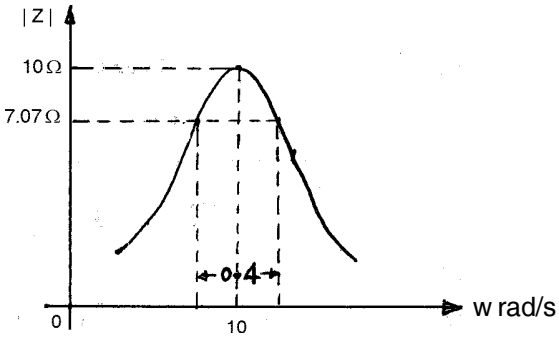

Fig. 4(b)

c) Find the value of L for which the circuit shown in Fig. 4(c) is resonant at a frequency of 500 rad/sec. **8**

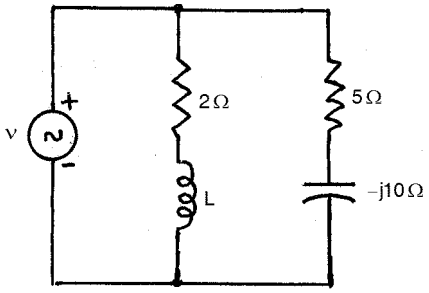

Fig. 4(c)

PART – B

5. a) State and prove :
   i) initial value theorem.
   ii) shifting theorem. **8**

   b) Find the current in a series R-L-C circuit comprising of a resistor of $R = 5\,\Omega$, inductance L = 1H and a capacitance $C = \frac{1}{4}F$ for each of the following inputs.
   i) Ramp function V = 12(t – 2)
   ii) Step function V = 3u(t – 3)
   iii) Impulse voltage $V = 3\delta(t - 1)$. **6**

   c) Find the inverse of $F(s) = \frac{s}{(s^2 + w^2)^2}$ using convolution theorem. **6**

6. a) Obtain the equivalent circuits of resistance, inductance and capacitance when the equilibrium is disturbed at t = 0 by switching operation. **8**

   b) In the network shown in the Fig. 6(b) a steady state is reached with switch K open with V = 100 volts, $R_1 = 10\,\Omega$, $R_2 = 20\,\Omega$, $R_3 = 20\,\Omega$, L = 1H and $C = 1\,\mu F$. At time t = 0, the switch is closed.
   i) Write the integro-differential equations for the network after the switch is closed.
   ii) What is the voltage V_0 across C before the switch is closed ? What is its polarity ?
   iii) Solve for initial value of i_1 and i_2 at t = 0.
   iv) Solve for $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$

v) Value of $\frac{di_1}{dt}$ at $t = \infty$. **12**

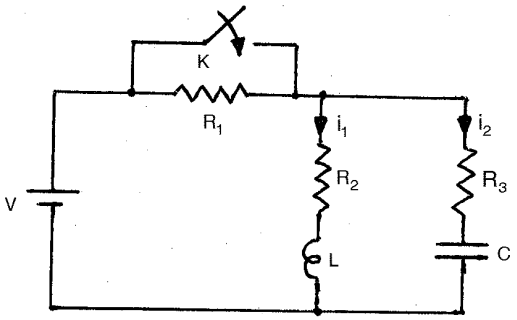

Fig. 6(b)

7. a) Define y-parameters of a 2 port network. Find the relation between Z-parameters and y-parameters. **10**

   b) Compute y-parameters for the network shown in the Fig. 7(b) and hence find Z-parameters. **10**

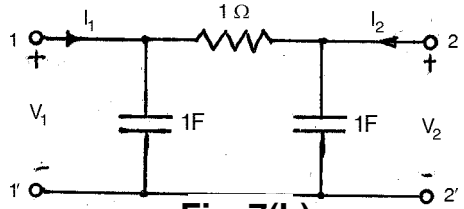

Fig. 7(b)

8. a) With a suitable network explain the following terms :
   i) Oriented graph ii) Tree iii) Cutset iv) Tieset. **4**

   b) In the network shown in Fig. 8(b), consider branches 1, 3 and 4 as forming a tree. Identify the link currents with the loop currents and write a tie-set schedule for the network. There from obtain equilibrium equations on loop basis. **12**

   $R_1 = 1\,\Omega$; $R_2 = R_4 = R_6 = 2\,\Omega$; $R_3 = R_5 = 3\,\Omega$.

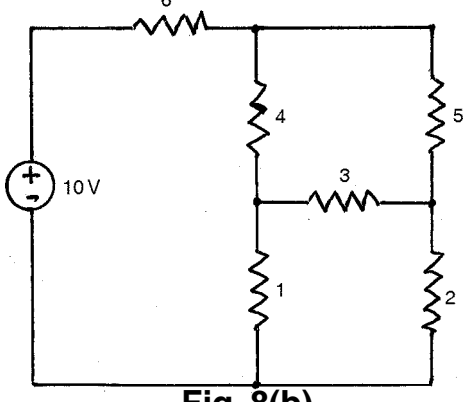

Fig. 8(b)

   c) Give the duals of the following : **4**
   i) Electric charge ii) Inductance
   iii) Capacitance iv) Flux linkage.
