Total No. of Questions—**12**] [Total No. of Printed Pages—**8+1**

Seat No.	

[4457]-63

S.E. (E & TC/Elec.) EXAMINATION, 2013

NETWORK ANALYSIS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and explain Thevenin's theorem. [4]

(*b*) Find current through 5 ohm resistor by superposition theorem in Fig. 1 : [6]

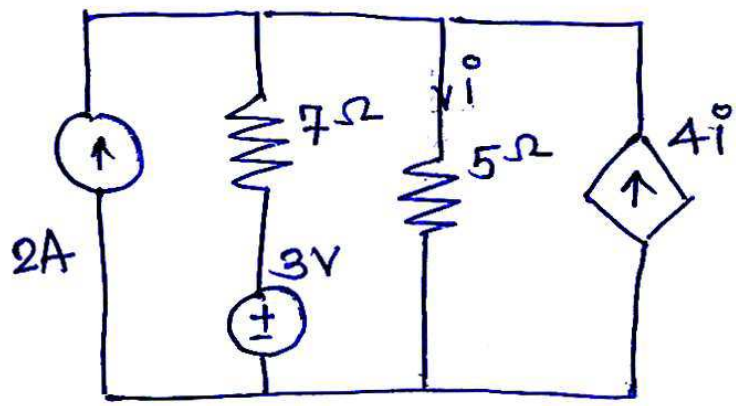

Fig. 1

(*c*) Using source shifting and source transformation, find current 'I' in the circuit shown in Fig. 2 : [8]

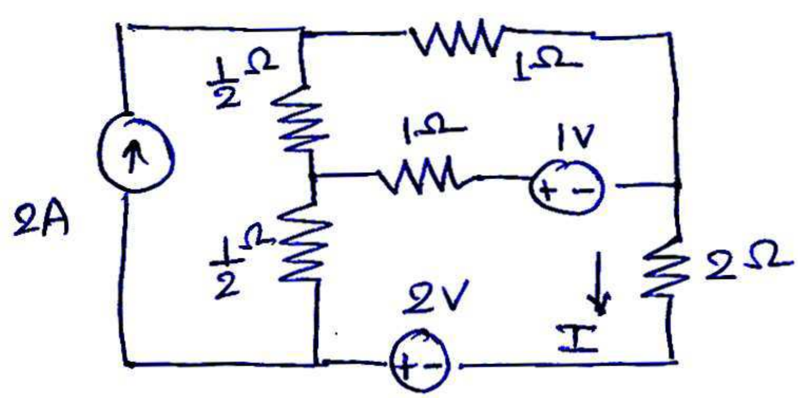

Fig. 2

Or

2. (*a*) State and explain maximum power transfer theorem for DC circuit. [4]

(*b*) Using Kirchhoff's law, determine current i_1 in the circuit shown in Fig. 3 : [6]

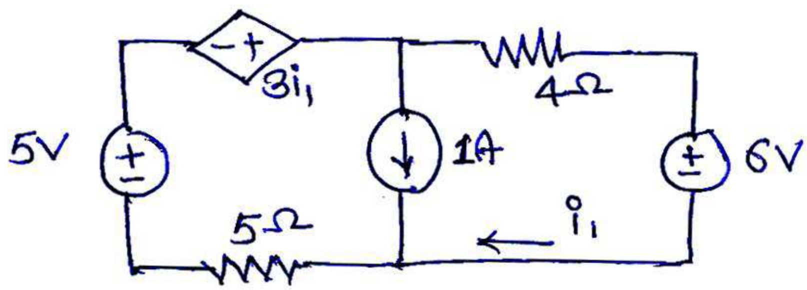

Fig. 3

(*c*) Find the Thevenin's and Norton's equivalent circuit across terminals AB in Fig. 4 : [8]

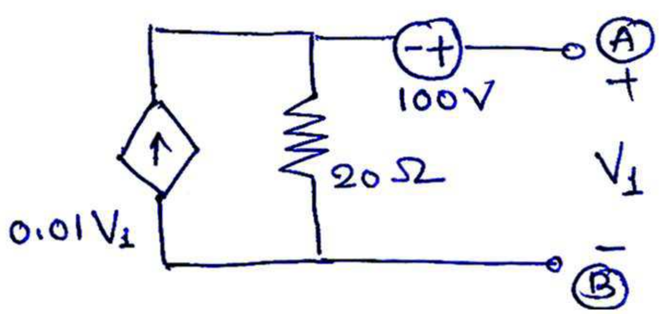

Fig. 4

3. (*a*) State the properties of series RLC circuit (any *four*). [4]

(*b*) A series RLC circuit consists of R = 100 Ω, L = 100 mH, C = 10 nF. Applied voltage is 100 V. Find : [6]

(*i*) Frequency at resonance

(*ii*) Q factor

(*iii*) Bandwidth.

(*c*) Justify, parallel resonant circuit is a current magnifier. [6]

Or

4. (*a*) Derive expression for resonant frequency for parallel resonant circuit. [4]

(*b*) A parallel resonant circuit has a coil of 100 mH with Q = 50. The coil is resonant at 900 kHz. Find the value of capacitor, resistance in coil and circuit impedance at resonance for Fig. 5 : [6]

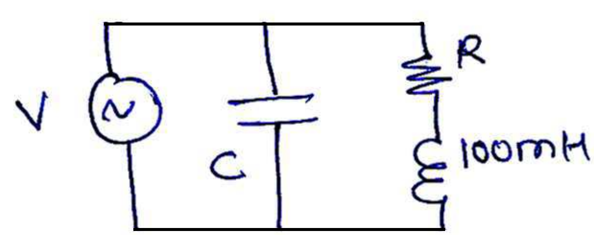

Fig. 5

(*c*) A series RLC circuit consists of R = 100 Ω and L = 20 mH. At what frequency the circuit would resonate to achieve a Q factor of 10. What value of capacitor should be selected for the above setup ? [6]

5. (*a*) Derive the relation between neper and decibel. [4]

(*b*) Design constant k-type low pass filter with cut-off frequency 10 kHz and design impedance of 600 Ω. For the above design draw T and π sections. [6]

(*c*) State properties of symmetrical and asymmetrical networks and derive expression for characteristic impedance of symmetrical T-network. [6]

Or

6. (*a*) What is constant k-type filter ? Derive expression for cut-off frequency of constant k low pass filter. [4]

(*b*) Design symmetrical T and π attenuators having characteristic resistance 600 Ω and attenuation 20 dB. [6]

(*c*) A four terminal network consists of a cascade connection of identical four symmetrical T sections with characteristic resistance of 300 Ω. The network is loaded into 300 Ω resistance and is driven by a generator of 10 V. Determine load current if series and shunt arm resistance of T-section are 100 Ω and 875 Ω respectively. [6]

SECTION II

7. (*a*) State initial and final value theorems for Laplace transform. [4]

(*b*) Steady state is reached when switch is open. Switch is closed at $t = 0$. Find current in inductor at $t > 0$ using Laplace transform (Refer Fig. 6) : [6]

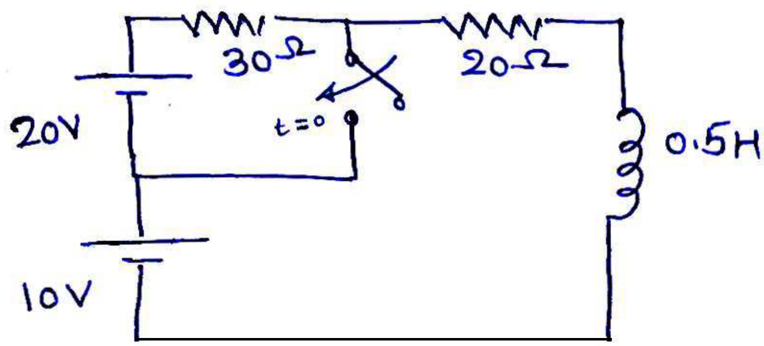

Fig. 6

(*c*) Steady state is reached when the switch is at position '*a*' at $t = 0$. Switch is shifted to position '*b*'. Find current in capacitor at $t > 0$ using Laplace transform (Refer Fig. 7) : [8]

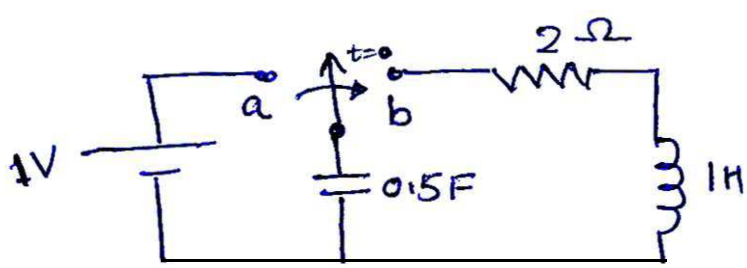

Fig. 7

Or

8. (*a*) State any *four* properties of Laplace transform. [4]

(*b*) In series R-C circuit initial charge on capacitor is 2×10^{-3} C. Find $i(t)$ $t > 0$ using Laplace transform (Refer Fig. 8) : [6]

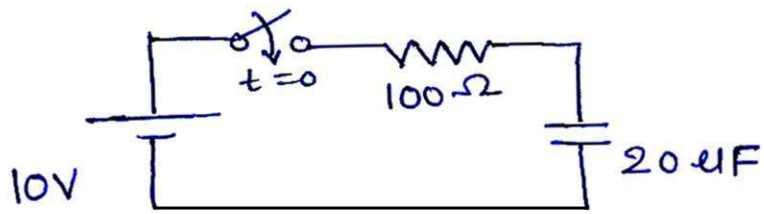

Fig. 8

(*c*) Steady state is reached when the switch is at position '*a*'. At $t = 0$ switch is shifted to position '*b*'. Find the current in inductor at $t > 0$ using Laplace transform (Refer Fig. 9) : [8]

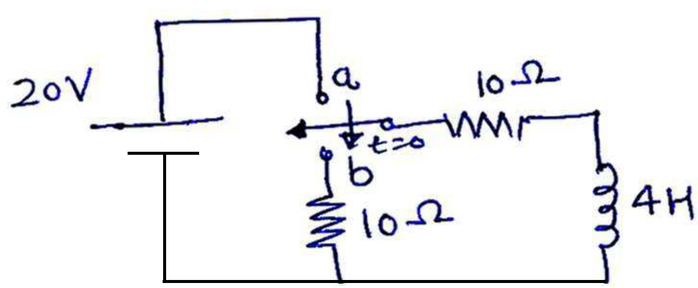

Fig. 9

9. (*a*) Derive the conditions for symmetry for Z and Y parameters. [8]

(*b*) For the network shown in Fig. 10, find driving point function and hence plot poles and zeros on s plane : [8]

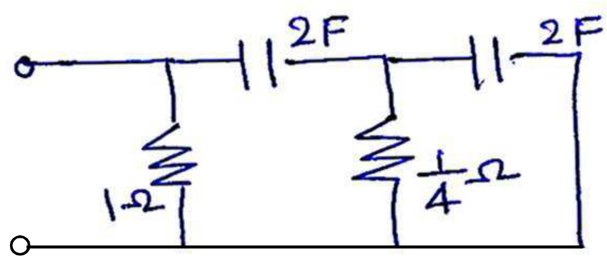

Fig. 10

Or

10. (*a*) Explain network functions for one port and two port networks. [8]

(*b*) Find ABCD parameters for the network shown in Fig. 11 : [8]

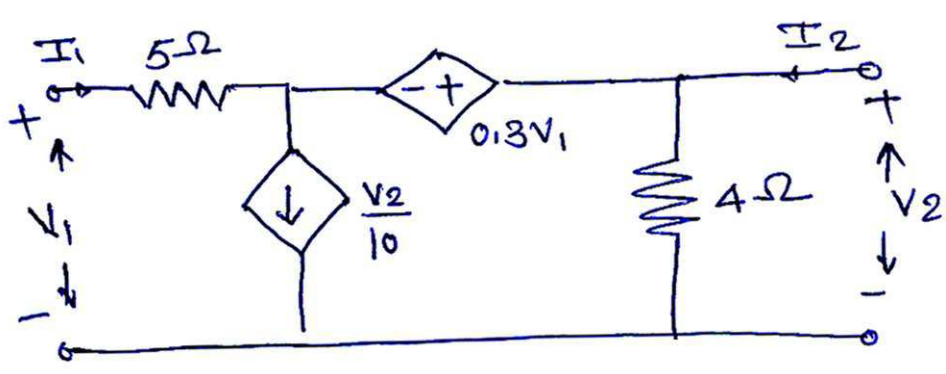

Fig. 11

11. (*a*) State primary and secondary constants for transmission line and derive the relation of Z_0 and γ in terms of primary constants. [8]

(*b*) A transmission line has the following constants : [8]

$R = 10.4\ \Omega$

$L = 3.666\ mH$

$C = 0.00835\ mF$

$Q = 0.08\ \mu\mho$

Find Z_0, α, β and v at $\omega = 5000$ rad/sec.

Or

12. (*a*) Explain standing wave voltage ratio related to transmission line and hence derive the expression for standing wave ratio in terms of reflection coefficients. [8]

(*b*) A transmission line has a characteristic impedance of 400 Ω. Determine the standing wave voltage ratio with the following receiving end impedances : [8]

(*i*) $Z_R = 70 + j0$

(*ii*) $Z_R = 800 + j0$

(*iii*) $Z_R = 650 - j475$.