

May - June - 2011

Total No. of Questions—12]

[Total No. of Printed Pages—8+2

[3962]-153**S.E. (E&TC) (First Semester) EXAMINATION, 2011****NETWORK ANALYSIS
(2008 PATTERN)****Time : Three Hours****Maximum Marks : 100****N.B. :-** (i) Answers to the two Sections should be written in separate answer-books.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

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

(v) Your answer will be valued as a whole.

(vi) Assume suitable data, if necessary.

SECTION I

1. (a) State and explain maximum power transfer theorem as applied to AC circuits. [4]
- (b) Using source transformation find current I in the following circuit shown in Fig. 1 provided in the given network all the sources are time invariant. [6]

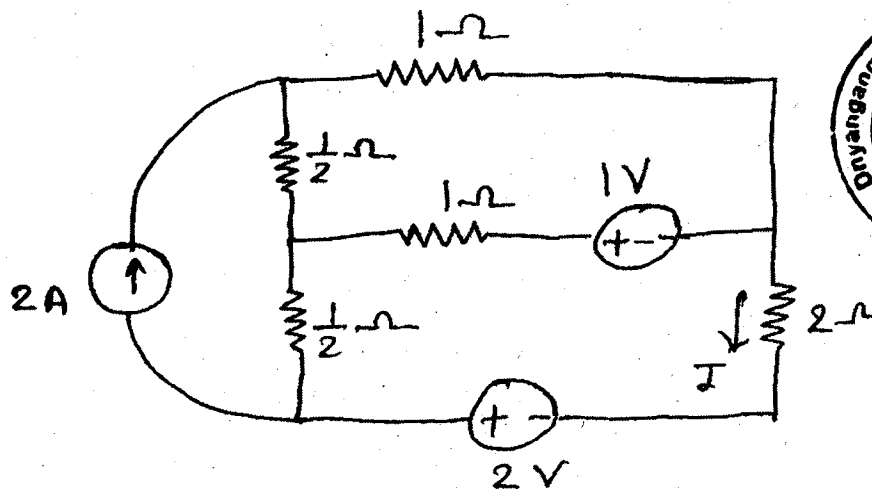


Fig. 1

P.T.O.

- (c) Find Thevenin's and Norton's equivalent circuit across AB in the circuit of Fig. 2. [8]

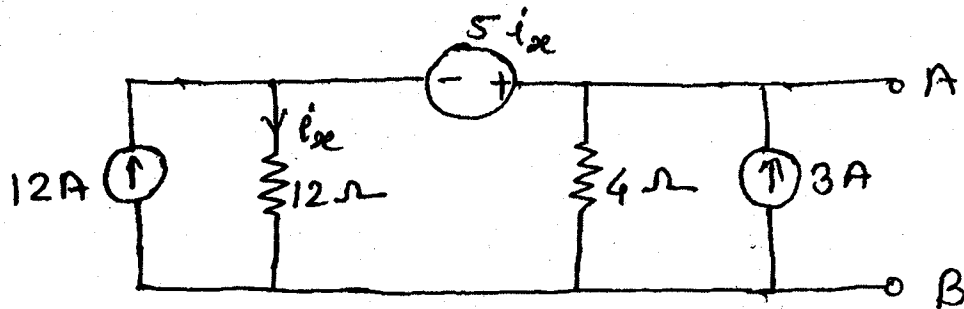


Fig. 2

Or

2. (a) Explain how source transformation is useful in circuit analysis. [4]
 (b) Using Kirchhoff's laws, determine current i , in the circuit shown in Fig. 3. [6]

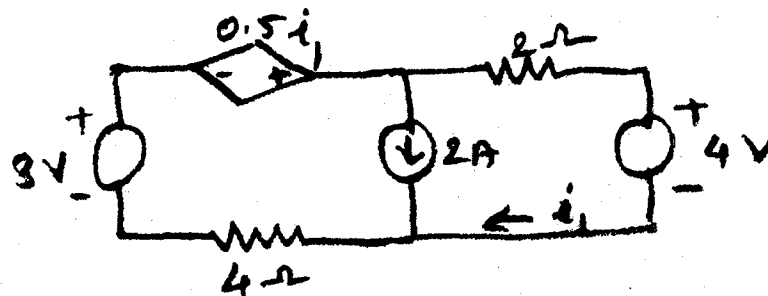


Fig. 3

- (c) Use the mesh analysis to find the power generated by each of the five sources in the circuit shown in Fig. 4. [8]

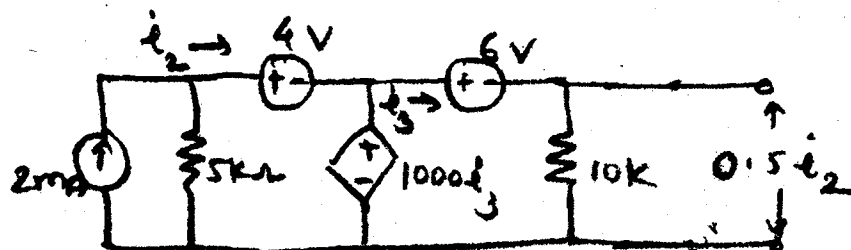


Fig. 4.

3. (a) Prove that a resonant frequency is geometric mean of two half power frequencies. [4]
- (b) A resistor and a capacitor are in series with a variable inductor. When this circuit is connected to 230 V, 50 Hz supply. The maximum current obtained by varying the inductor is 0.366 A. The voltage across the capacitor at that instant is 300 V. Find the circuit components. [6]
- (c) Find the value of V for which the circuit shown in Fig. 5 is resonant at a frequency of $\omega_0 = 1000$ rad/sec. [6]

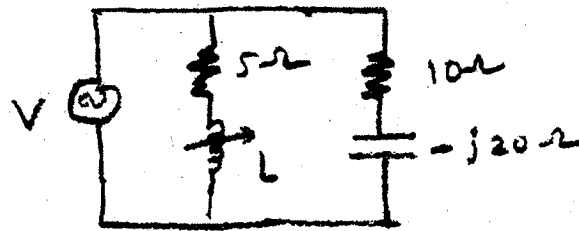


Fig. 5

Or

4. (a) Draw any reactance curve characteristics for series resonant circuit. [4]
- (b) A series RLC circuit consists of $R = 100 \Omega$, $L = 100$ mH and $C = 10$ nf. The applied voltage across circuit is 100 V. Find :
- (i) Resonant frequency (ω_0)

- (ii) Quality factor at resonance Q_0
 - (iii) Two half power frequencies ω_1 and ω_2
 - (iv) Bandwidth ($\Delta\omega$). [6]
- (c) A parallel resonant circuit has a coil of 150 μH with Q factor of 100 and is resonated at 1 MHz :
- (i) Specify the required value of capacitance.
 - (ii) What is resistance of coil ?
 - (iii) What is resistance of circuit at parallel resonance ?
 - (iv) What is absolute bandwidth of resonant circuit ?
 - (v) What is B.W. circuit when matched with Z_g ? [6]
5. (a) Define and explain image and Iterative Impedances of a half section. [4]
- (b) Each of two series elements of T-type LPF consists of an inductance of 60 mH, and shunt element of 0.2 μf capacitor. Calculate cut-off frequency and design impedance at 1 kHz. Also find ratio of phase difference between input and output voltages of the filter at 1 kHz and 5 kHz. [6]
- (c) A certain T-network consists of a series arm of 800 Ω and shunt arm of 1 k Ω . Convert this into equivalent π -network.

Obtain the image impedance of half L-section obtained by splitting above T-network. [6]

Or

6. (a) What are the disadvantages of prototype filters ? How are they corrected in the m -derived filter ? Why is $m = 0.6$ used for terminating half sections ? [4]
- (b) An attenuator consists of symmetrical π -section, with series arm of 175Ω and shunt arm of 350Ω . Calculate characteristic impedance and attenuation per section. [4]
- (c) A four terminal network consists of a cascade connection of identical and four symmetrical T-sections with characteristic resistance of 300Ω . The network is loaded into 300Ω resistance and is driven by a generator of 10 V . Determine load current if series and shunt are resistance of T-section are 100Ω and 875Ω respectively. [8]

SECTION II

7. (a) For the first order R-L circuit explain the following terms :
- (i) Time constant
- (ii) Rise time
- (iii) Delay time. [4]

- (b) In the circuit shown in Fig. 6, the switch is moved from position 1 to 2 at $t = 0$. The steady state being reached for $t < 0$. Find $i(t)$ after switching. [6]

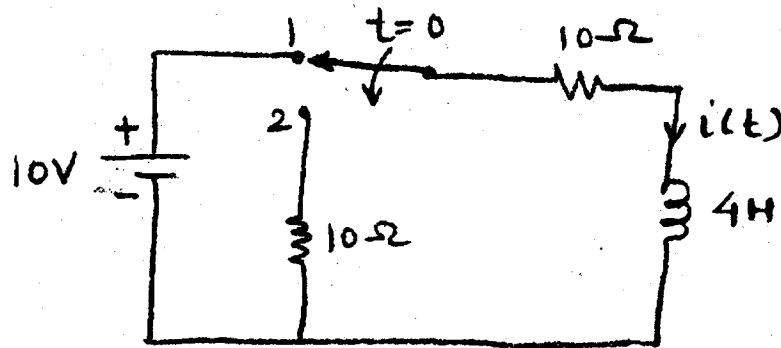


Fig. 6

- (c) In the circuit shown in Fig. 7, the switch is moved from position 'a' to 'b' at $t = 0$. Prior to this steady state was reached. Find $i(t)$ after switching. [6]

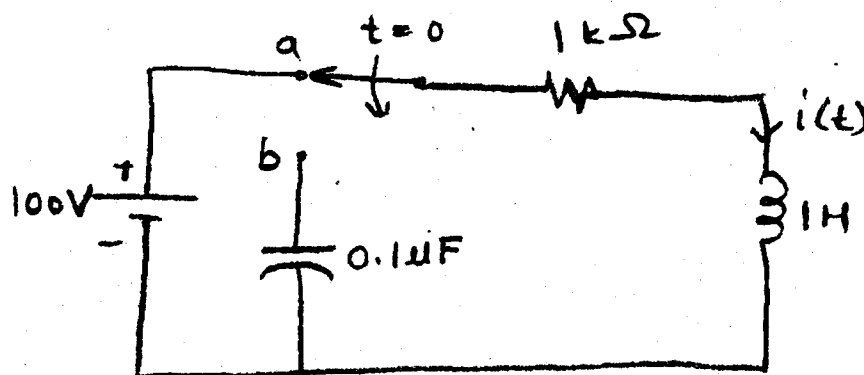


Fig. 7

Or

8. (a) Compare time domain analysis with frequency domain analysis using Laplace transform. Give advantages of L.T. method of analysis. [4]
- (b) The network shown in Fig. 8, reaches a steady state with switch 'k' opened. At $t = 0$, the switch is closed, find $i(t)$ for $t > 0$. [6]

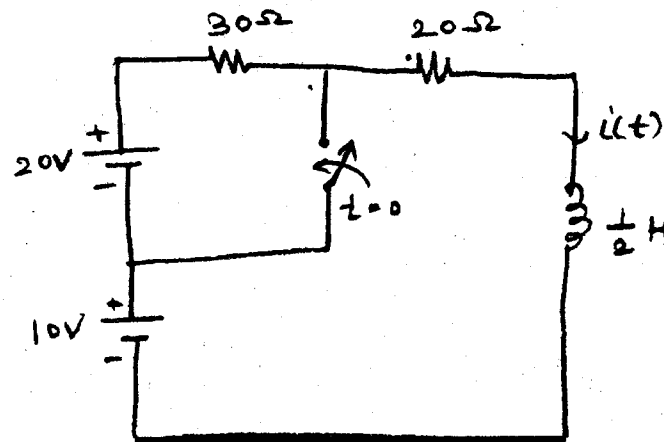


Fig. 8

- (c) In how many seconds after $t = 0$ has current $i(t)$ become one half of its initial value in the given circuit shown in Fig. 9. [6]

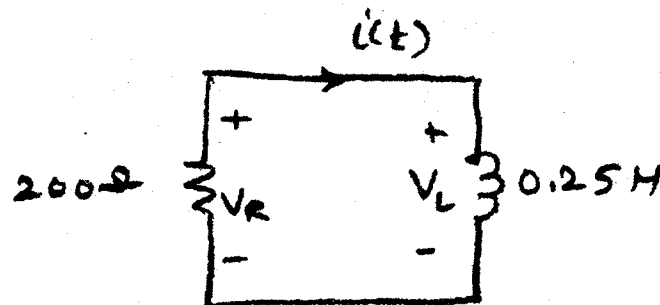


Fig. 9

9. (a) What is network function ? Give various types of network functions for one and two port networks. [4]
- (b) Determine the value of $\frac{V_2}{I_1}$ and $\frac{V_2}{V_1}$ for the following network shown in Fig. 10. [6]

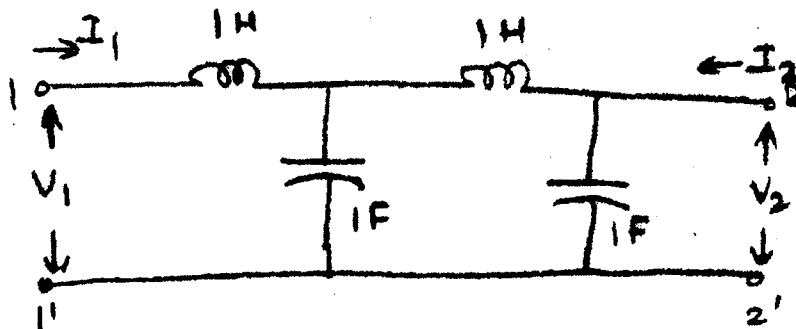


Fig. 10

- (c) Determine 'y' parameters for the network shown in Fig. 11. [6]

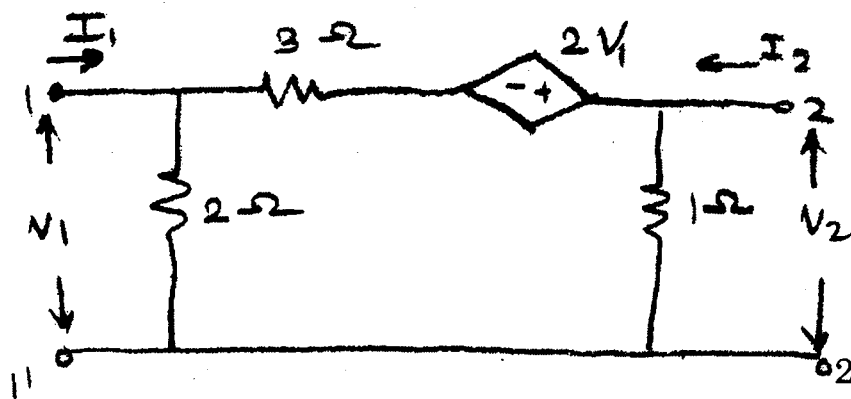


Fig. 11

Or

10. (a) Give essential properties of driving point function and transfer function. [4]
- (b) Obtain the conditions for reciprocity and symmetry in terms of hybrid parameters in a two port network. [6]
- (c) Determine 'Z' parameters of the network shown in Fig. 12. [6]

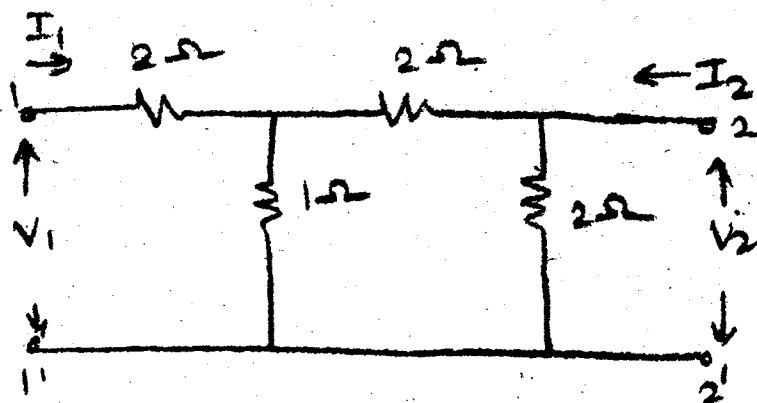


Fig. 12

11. (a) Derive the relation between standing wave ratio (SWR) and reflection coefficient (k). [4]
- (b) A generator of 1 V, 1 kHz supplies power to 100 km long line terminated in Z_0 and having the following parameters : $R = 10.4 \Omega/\text{km}$, $L = 0.00367 \text{ H/km}$, $G = 0.8 \times 10^{-6} \text{ mho/km}$ and $C = 0.00835 \times 10^{-6} \text{ F/km}$. Calculate Z_0 , attenuation constant α , phase shift β , wavelength λ and velocity v . [10]

- (c) A transmission line has characteristic impedance 50Ω and is terminated in load impedance of $(75 + j40)\Omega$. Calculate the reflection coefficient and SWR. [4]

Or

12. (a) Explain in brief primary and secondary constant for transmission line. Also state the relation between them. [4]

- (b) Calculate the characteristic impedance, attenuation constant and phase shift constant of a transmission line, if the following measurements have been made on the line :

$$Z_{oc} = 555 \angle -60^\circ \Omega \text{ and } Z_{sc} = 500 \angle -14^\circ \Omega. \quad [10]$$

- (c) What is distributed and Lumped network ? Explain the equivalent circuit of transmission line. [4]