Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[5057]-63

S.E. (Electronics/E&TC) (First Semester) EXAMINATION, 2016

NETWORK ANALYSIS

(2008 PATTERN)

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

N.B. **:—** (*i*) Answer **3** questions from Section I and **3** questions from Section II.

(*ii*) Answer 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 table is allowed.

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

SECTION I

1. (*a*) Determine the loop currents I_1 and I_2 in the network shown in Fig. 1 using mesh analysis method. [6]

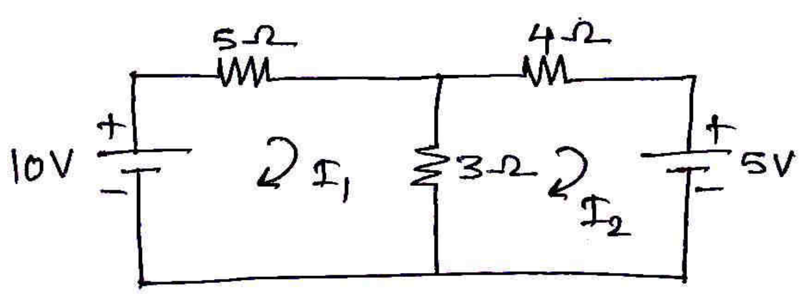

Fig. 1

(*b*) List all dependent and independent energy sources. Draw their symbols and explain the concept of source transformations. [6]

(*c*) State and explain Kirchhoff's laws. [4]

Or

2. (*a*) Determine the node voltages V_1 and V_2 in the network shown in Fig. 2. Also determine the currents through 3 Ω, 6 Ω and 2 Ω resistors using nodal analysis method. [8]

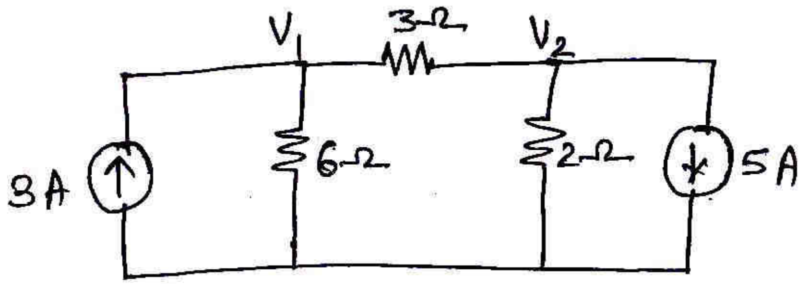

Fig. 2

(*b*) State and explain Thevenin's and Norton's laws. [8]

3. (*a*) Define the term quality factor of a coil. Derive its expression for a coil shown in Fig. 3 and explain its significance with respect to losses and bandwidth of a series resonant circuit. [6]

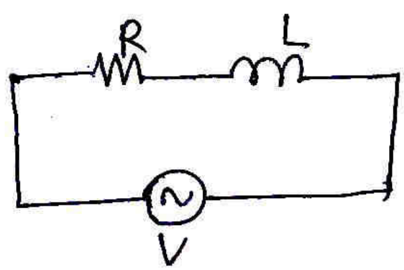

Fig. 3

(*b*) For a circuit shown in Fig. 4, determine the resonant frequencies (ω_r, f_r), quality factor (Q_r) at resonance, impedance at resonance and bandwidth. [6]

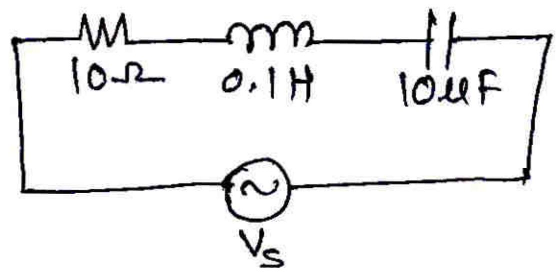

Fig. 4

(*c*) Derive the expression for resonant frequency in series resonant circuit. [4]

Or

4. (*a*) Derive the expression for resonant frequency in parallel (antiresonant) circuit. [8]

(*b*) For a circuit shown in Fig. 5, determine the capacitance such that the circuit resonates at 1 MHz. Also determine I_r, quality factor at resonance, voltage across capacitance and bandwidth. [8]

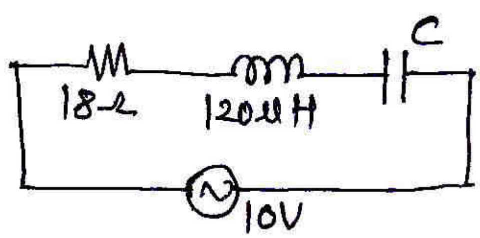

Fig. 5

5. (*a*) For symmetrical T network show that : [6]

$$z_0 = \sqrt{\frac{z_1^2}{4} + z_1 z_2}\,.$$

(*b*) Derive design equations for constant K low pass filter. [6]

(*c*) Define and explain characteristic impedance and propagation constant for symmetrical networks. [6]

Or

6. (*a*) Derive design equations for symmetrical T attenuator. [8]

(*b*) Sketch the reactance V_s frequency curves of high pass constant K-filter and obtain expression for cut-off frequency. [6]

(*c*) Derive relationship between db and Neper. [4]

SECTION II

7. (*a*) State and explain any *three* properties of Laplace transform. [6]

(*b*) State and explain Initial and Final value theorem of Laplace transform. [4]

(*c*) If

$$F(s) = \frac{s+2}{s(s+3)\,(s+4)}\,.$$

Find inverse Laplace transform. [6]

Or

8. (*a*) Find Laplace transform of : [6]

(1) $\cos(\omega t)$

(2) t^n

(3) $t \cdot e^{-at}$.

(*b*) Define Laplace transform and explain physical significance of complex frequency. [4]

(*c*) If

$$F(s) = \frac{7s+2}{s^3+3s^2+2s},$$

find inverse Laplace transform. [6]

9. (*a*) Obtain the conditions of symmetry and reciprocity for *h* parameters. [6]

(*b*) What are initial conditions ? Explain the significance of initial conditions while solving network equations. [4]

(*c*) Determine 'Z' parameters of the given network. [6]

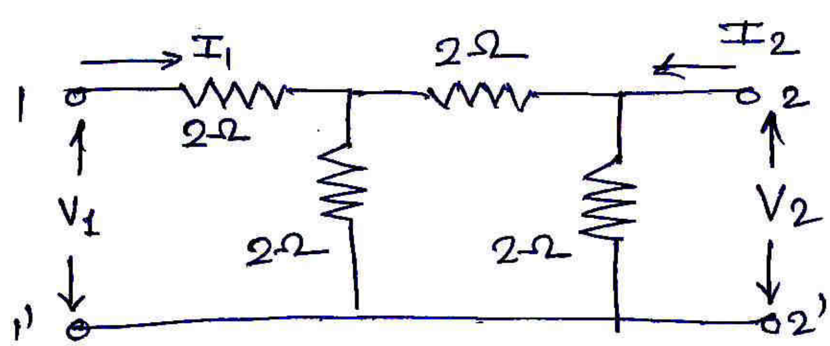

Fig. 6

Or

10. (*a*) What is a network function ? Explain various types of network functions for a one port and two port network. [6]

(*b*) Explain the significance of poles and zeros in network analysis. [4]

(*c*) Explain in detail the interconnection of two port networks. [6]

11. (*a*) Derive the equation for characteristic impedance and propagation constant of a transmission line in terms of primary constants. [6]

(*b*) Define wavelength and group velocity with respect to transmission line. [4]

(*c*) A transmission line cable has the following primary constants $R = 78\ \Omega/km$, $G = 62\ \mu mho/km$, $L = 1.75\ mH/km$ and $c = 0.0945\ \mu F/km$ at 1.6 kHz, $\omega = 1000$ rad/s.

Calculate :

(*i*) Characteristic impedance Z_0

(*ii*) Attenuation constant α in Nepers and dB/km

(*iii*) Phase constant B in radians and degree/km

(*iv*) Wavelength λ in km. [8]

Or

12. (*a*) State and explain primary and secondary line constants for a transmission line. [6]

(*b*) What is distributed and lumped network ? Explain the equivalent circuit of transmission line. [4]

(*c*) Explain the concept of standing with respect to transmission lines. Establish a relation between VSWR and reflection coefficient. [8]