Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4657]-544

S.E. (Electronics/E&TC) (First Semester) EXAMINATION, 2014

NETWORK THEORY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

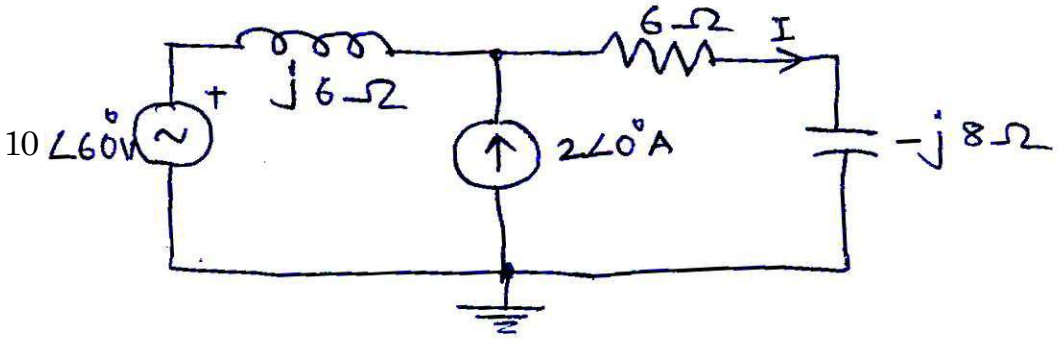
(*ii*) Figures to the right indicate full marks.

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

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

(*v*) All questions are compulsory.

1. (*a*) Calculate the current I through 6 Ω resistor by applying principle of superposition. [6]



P.T.O.

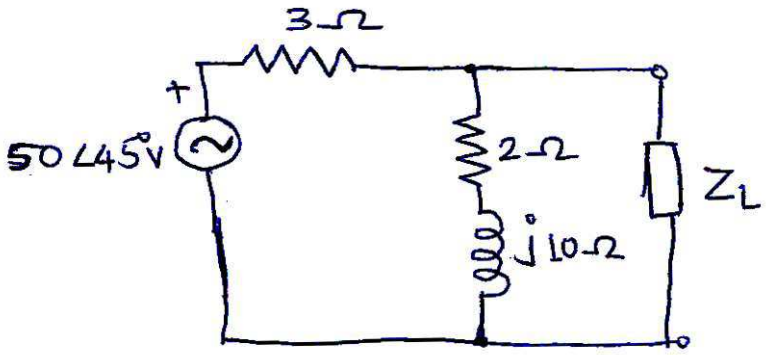
(*b*) The reduced incidence matrix of an oriented graph is :

$$A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}.$$

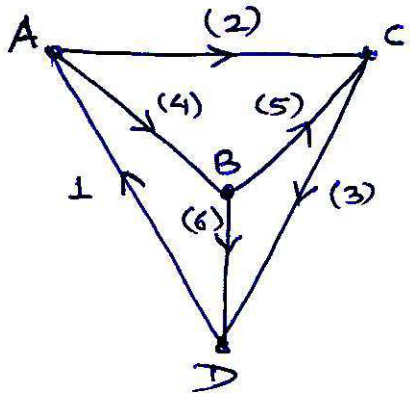
Draw the oriented graph. Also calculate the number of trees possible for this graph. [6]

Or

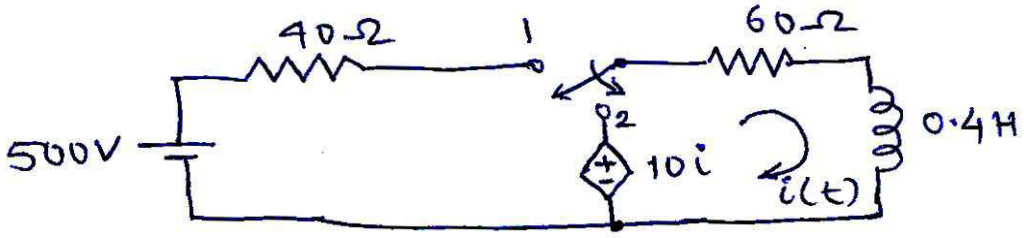
2. (*a*) Find the value of load impedance Z_L, so that maximum power can be transferred to it in the circuit shown below. Draw Thevenin's equivalent circuit. [6]



(*b*) Write the incidence matrix, tieset matrix and *f*-cutset matrix for the graph of a network given below. Select tree {4, 5, 6}. [6]

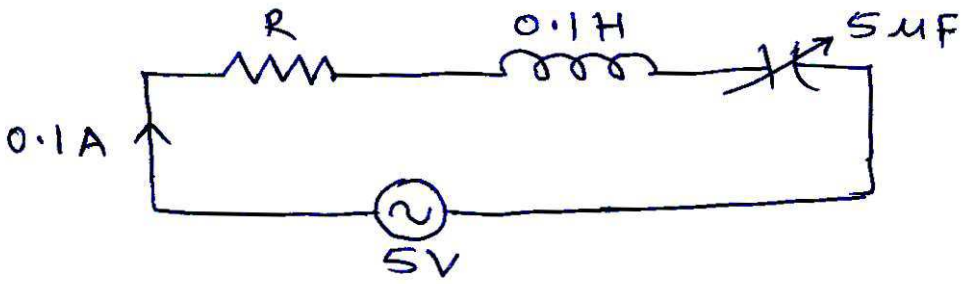


3. (*a*) For the network shown below, find the current expression i.e. $i(t)$ when the switch is changed from the position 1 to 2 at $t = 0$. [6]



(*b*) In a series RLC circuit, a maximum current of 0.1 A flows through the circuit when the capacitor is of 5 μF with a fixed frequency and a voltage of 5 V.

Determine the frequency at which the circuit resonates, the quality factor, the value of resistance and the bandwidth. [6]

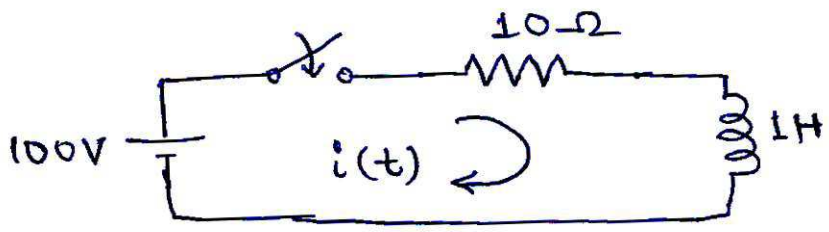


Or

4. (*a*) In the figure given below, the switch is closed at $t = 0$. Find :

$$i, \quad \frac{di}{dt} \quad \text{and} \quad \frac{d^2i}{dt^2}$$

at $t = 0^+$. [6]



(*b*) Derive the expression for bandwidth of a series RLC resonance circuit. [6]

5. (*a*) Explain the following terms used in filter theory :

(*i*) Attenuation constant,

(*ii*) Phase constant, and

(*iii*) Characteristic impedance. [6]

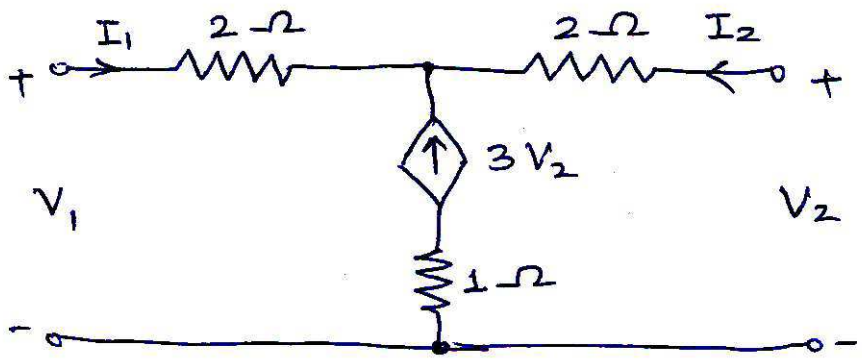
(*b*) Write a short note on attenuators. Also derive the relation between decibel and Neper. [7]

Or

6. (*a*) A π section filter network consists of a series arm inductor of 20 mH and two shunt-arm capacitors of 0.16 μF each. Calculate the cut-off frequency, attenuation and phase shift at 15 kHz. [6]

(*b*) Design a T-section band-pass, constant K type filter with cut-off frequency of 4 kHz and 10 kHz and nominal characteristic impedance of 500 Ω. [7]

7. (*a*) Find Y-parameters of the network shown below. [6]



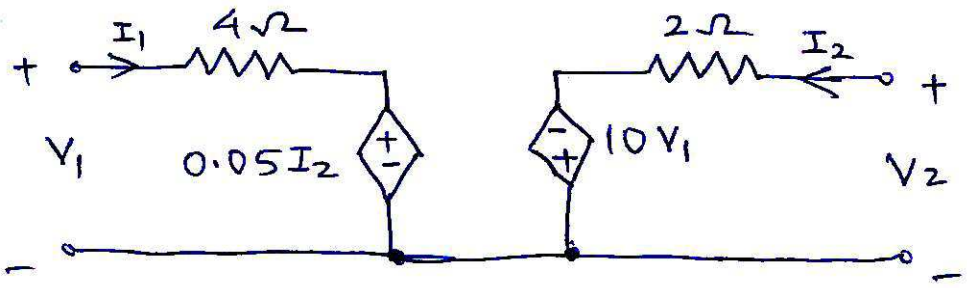
(*b*) Explain the following :

(*i*) Network functions for one and two port networks.

(*ii*) Pole-zeros of network functions. Also state its significance. [7]

Or

8. (*a*) Calculate the open-circuit impedance parameters for the network shown below and also check for symmetry and reciprocity of the network. [6]



(*b*) Determine the voltage transfer function $\frac{V_2}{V_1}$, for the network shown below. [7]