Total number of printed pages: 5 **UG/3rd Semester/UIE301**

2022

NETWORK THEORY

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

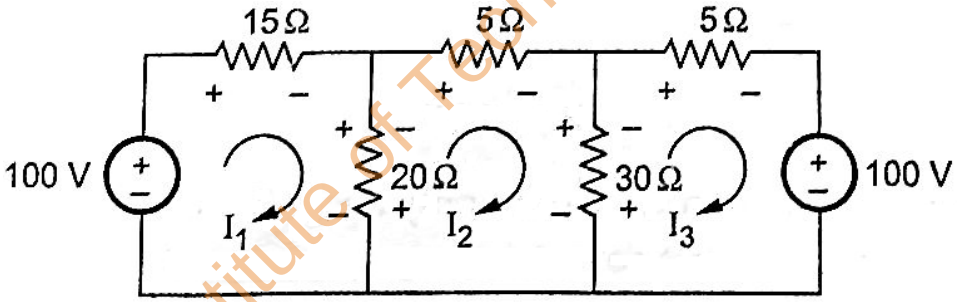
*Answer **any five** questions.*

1. a) Differentiate the following network elements: 2+2=4

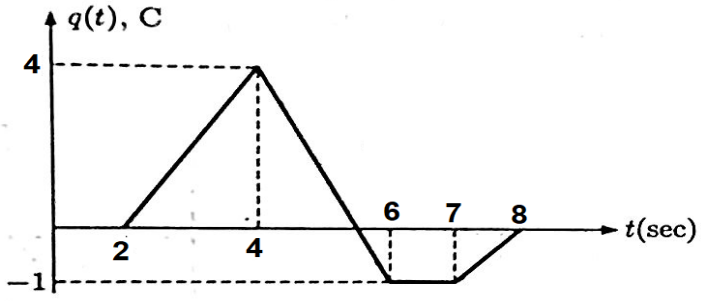
   (i)Linear and Non-linear

   (ii)Active and passive

   b) For the circuit shown in the figure below find the current through 30Ω resistance using mesh analysis 6

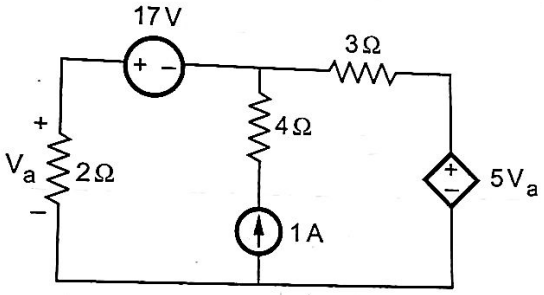


   c) The charge flowing in a circuit element is plotted in the following figure. Draw the plot for current i(t) 8

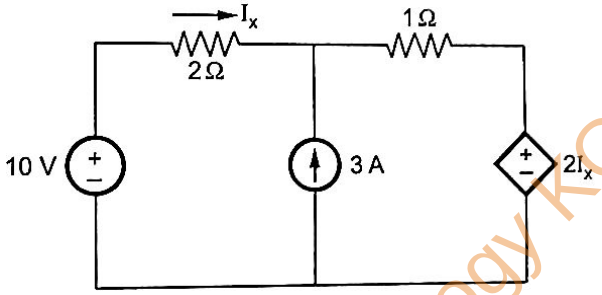


   d) Explain various dependent sources. 2

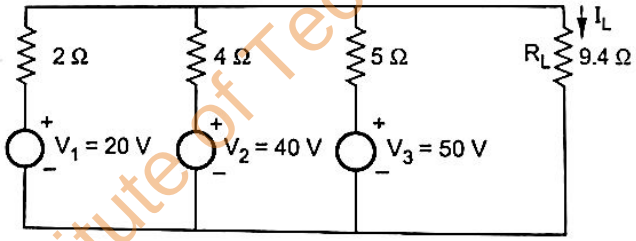
2. a) Find V_a using Superposition principle in the circuit shown below 6



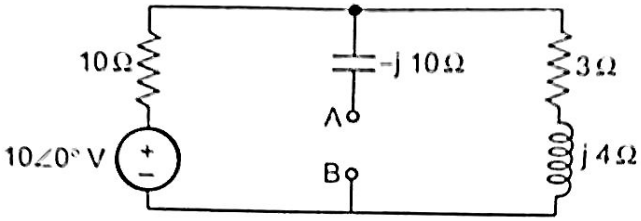
b) Obtain the current I_X by Thevenin's theorem. 8



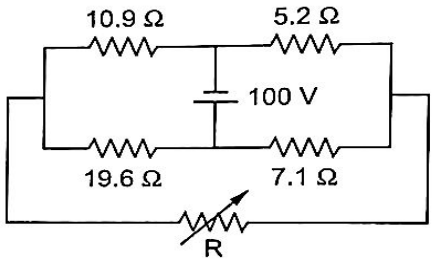
c) Using Millman's theorem find I_L through R_L for the network shown below. 6



3. a) Replace the network at terminals AB with Norton's equivalent circuit. 8



b) For the following given circuit find the value of R that will receive maximum power. 8



c) State and explain reciprocity theorem. 4

4. a) Define following terms: 3

(i) Q factor (ii) Bandwidth (iii) Selectivity

b) Show that resonant frequency of series resonance circuit is equal to the geometric mean of two half power frequencies. 7

c) It is required that a series RLC circuit should resonate at 1 MHz. Determine values of R,L and C if bandwidth of the circuit is 5 kHz and its impedance is 50 Ω at resonance. 6

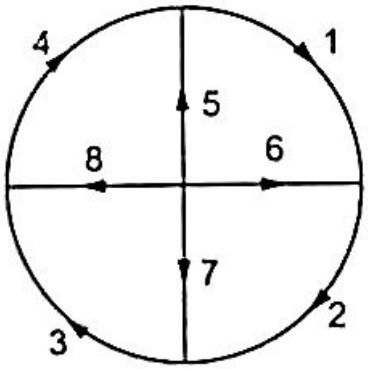
d) Explain the properties of RLC series resonant circuit. 4

5. a) Distinguish the following 4

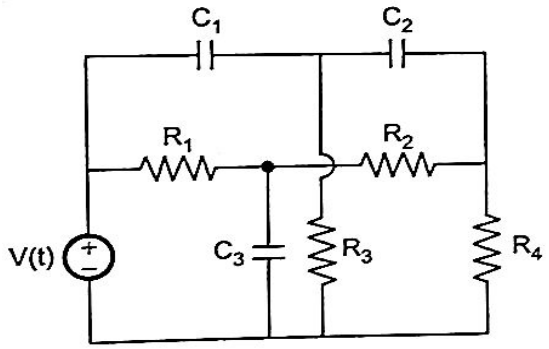
(i) Oriented and unoriented graph

(ii) Planner and non-planner graph

b) For the graph shown below write tie set and cut set matrices with chords (4,5,2,8) 10



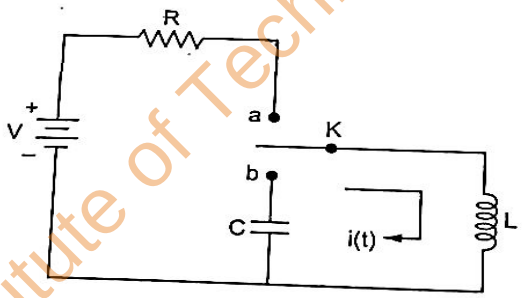
c) Construct dual network of the circuit shown below. 6



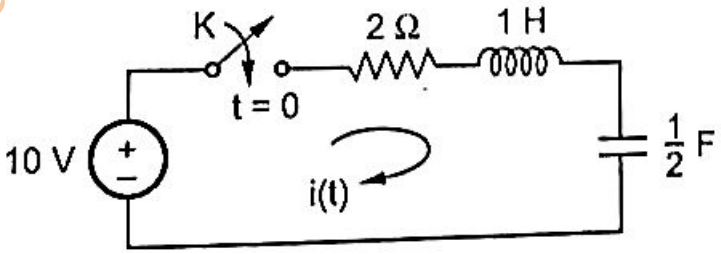
6 a) Use initial and final value theorems to find f(0) and f(∞) 4

$$F(s) = \frac{s^3 + 7s^2 + 5}{s^4 + 3s^3 + 4s^2 + 2s}$$

b) In the network shown below the switch K is moved from position 'a' to 'b' at t=0 (a steady state existing in position 'a' before t=0). Solve for the current i(t), using Laplace Transformation. 6

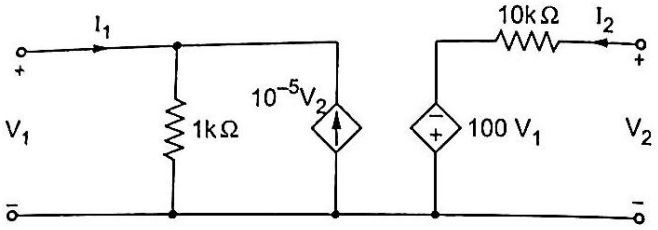


c) In the network shown switch K is closed at t=0, with the capacitor uncharged. Find the values for $i(0^+)$, $di(0^+)/dt$, and $d^2i(0^+)/dt^2$. 10



7 a) Define Z and Y parameters. 4

b) Find Z parameter for the following circuit. 10



c) Establish a relationship between line and phase voltages and currents in a star connection. 6