INDRAPRASTHA INSTITUTE OF INFORMATION TECHNOLOGY DELHI
ECE 113 BASIC ELECTRONICS
MID-SEMESTER EXAMINATION

Date: July 17, 2021 Maximum Marks: 50
Time: 10:00 AM to 11:00 AM

Notes:

1) Attempt any Five.
2) Please justify your answer with appropriate mathematical justification. An answer without justification may fetch zero marks.
3) Please use notations appropriately. Wrong notations may fetch zero marks
4) Maximum Marks 50.

Question:

Q1. A battery of E volts is supplying a steady current to a series circuit of total resistance R ohms and inductance of L henrys. A part R_1 of the total resistance is suddenly short circuited. Derive
(a) Expression for the current flowing in the battery subsequent to this operation.
(b) If E = 100 V; R = 20 Ω; R_1 = 10 Ω; and L = 2 H, plot the current/ time curve and determine the current at 0.1 sec and 0.5 sec after short circuit.

[10 marks]

Q2. (a) What values must R_1 and R_2 have in Figure 1, so that (i) I_1 = 4 A and I_2 = 6 A and both currents are charging the batteries, (ii) I_1 = 2 A discharging and I_2 = 20 A charging, (b) Under what condition I_2 will be zero?

[3.5+3.5+3 = 10 Marks]

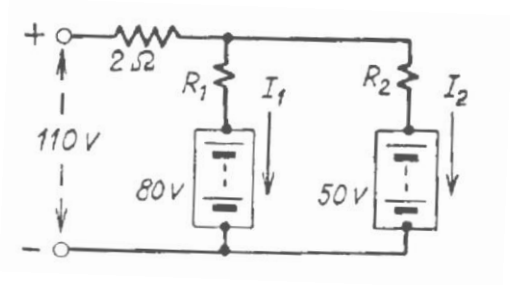

Figure 1

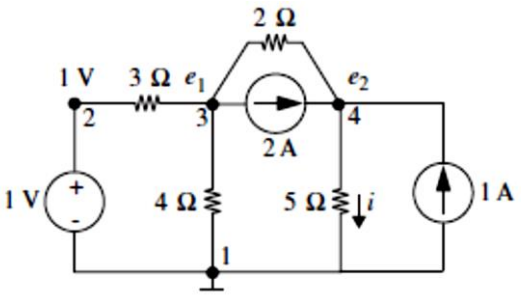

Figure 2

Q3. (a) Determine the current i through the 5 Ω resistance in Figure 2.

(b) Find the Thévenin resistance of the circuit in Figure 3 across terminals A and A'.

[7+3 Marks]

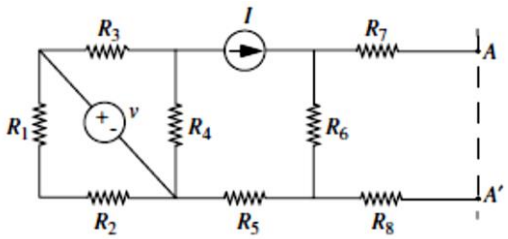

Figure 3

Q4. For the circuit shown below find v(t) for t > 0.

[10 Marks]

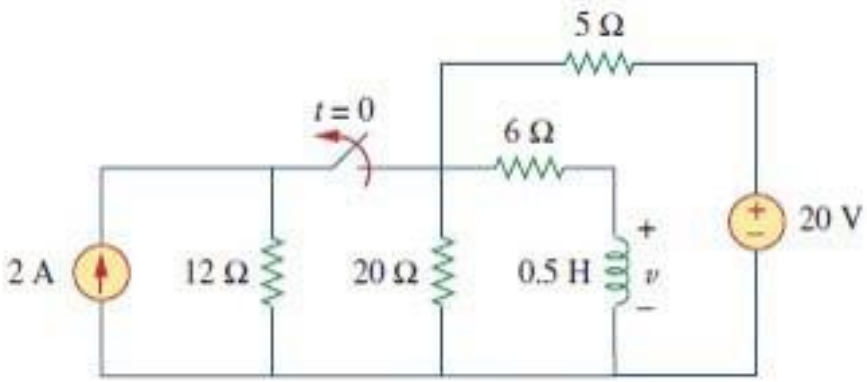

Figure 4

Q5. A student is given an unknown resistive network as illustrated in Figure 5(a). She/he wishes to determine whether the network is linear, and if it is, what its Thévenin equivalent is.
The only equipment available to the student is a voltmeter (assumed ideal), 100 kΩ and 1 MΩ test resistors that can be placed across the terminals during a measurement as in Figure 5(b).

The following data were recorded:

Test Resistor	Voltmeter Reading
Absent	1.5 V
100 k Ω	0.25 V
1 M Ω	1.0 V

What should the student conclude about the network from these results? Support your conclusion with plots of the network $v - I$ characteristics.

[10 Marks]

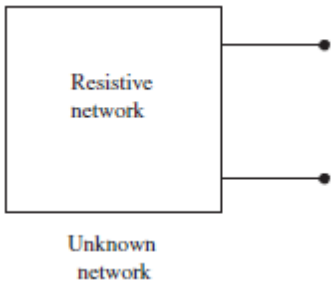

Figure 5(a).

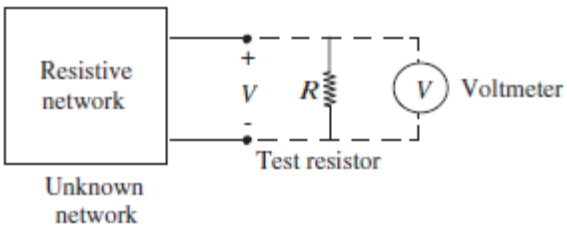

Figure 5(b).

Q 6. In the given Figure 6, switch is closed initially for long time and it is opened at t=0.
Find the current through the resistance R2, i.e. $i_{R2}(t)$, for t >0.
{Given that: R1=R2=10 ohm, L= 1mH, C=40uF, and supply voltage, V=20 V}.

[10 Marks]

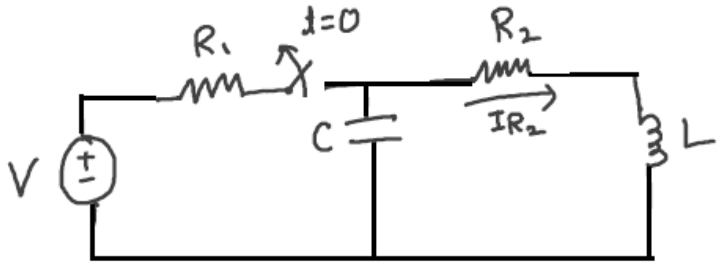

Figure 6