Reg No.:_____ **02000EE201092002** Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third semester B.Tech examinations (S) September 2020

Course Code: EE201

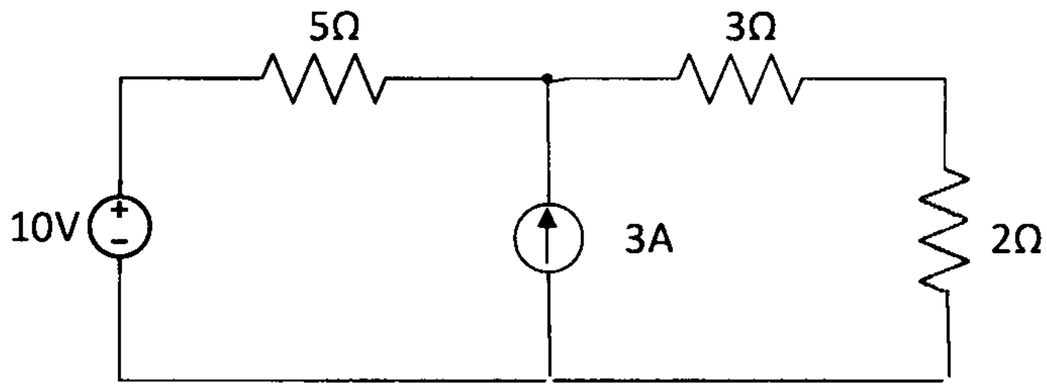
Course Name: CIRCUITS AND NETWORKS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

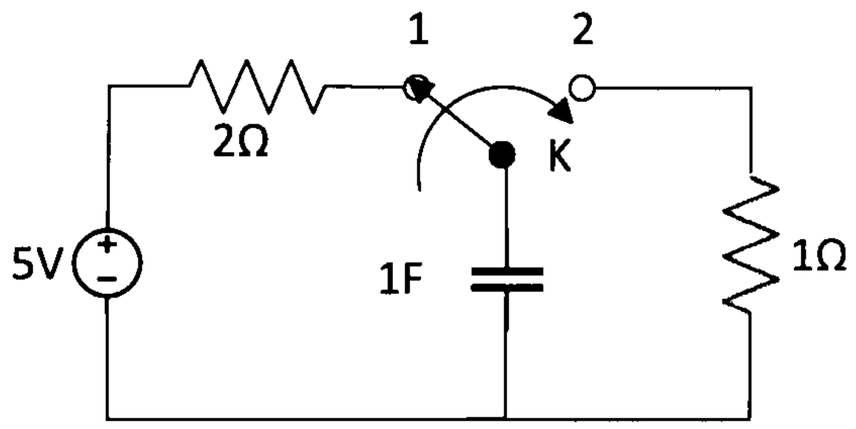
1 Compute the power dissipated in the 2Ω resistance in the network shown below, using superposition principle. Assume all the active sources as ideal. (5)



2 Define the following terms with an example: (i) Graph (ii) Directed graph (iii) tree (iv) link (v) twig (5)

3 A series RC circuit has R=10Ω and C=1F. If the circuit is connected to a 10V DC supply at time t=0, determine (i) the time at which the voltage across the capacitor is 5V and (ii) the circuit current at that instant. (5)

4 The switch K in the circuit given below has been at position 1 for a long time. At $t = 0$, the switch is moved to position 2. Determine the current flowing through the 1Ω resistance for $t \geq 0$ using Laplace transform technique. (5)



5 What is ABCD parameters? Why are they called transmission parameters? (5)

6 Show that for a two-port network $[Y]=[Z]^{-1}$. (5)

7 State the properties of Hurwitz polynomials. (5)

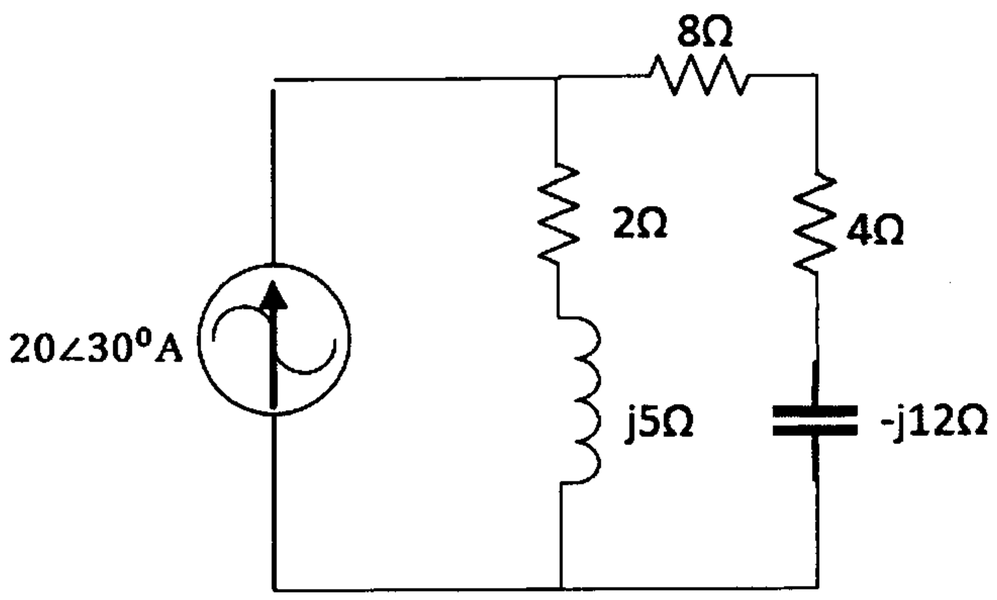
8 Determine whether the following function is a positive real function. (5)

$$F(s) = \frac{s+2}{s+1}$$

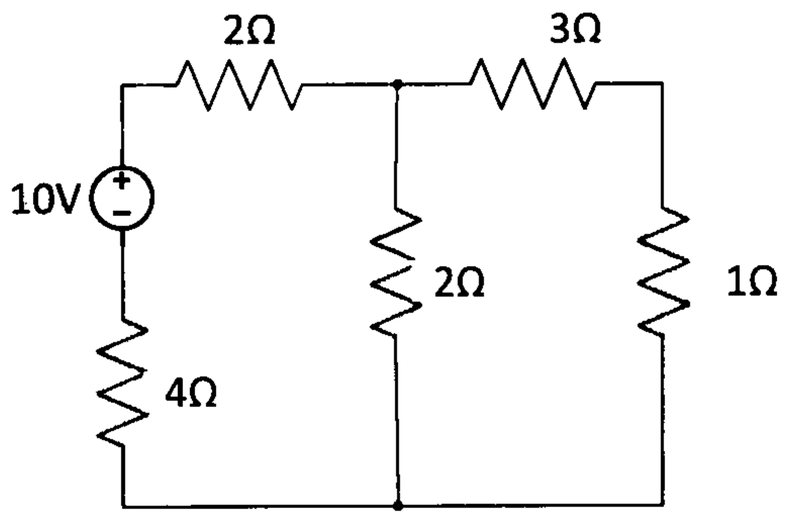
PART B

Answer any two full questions, each carries 10 marks.

9 Determine the voltage drop across the 8Ω resistance in the circuit given below, using Norton's theorem. Also calculate the power dissipated in the resistance. (10)



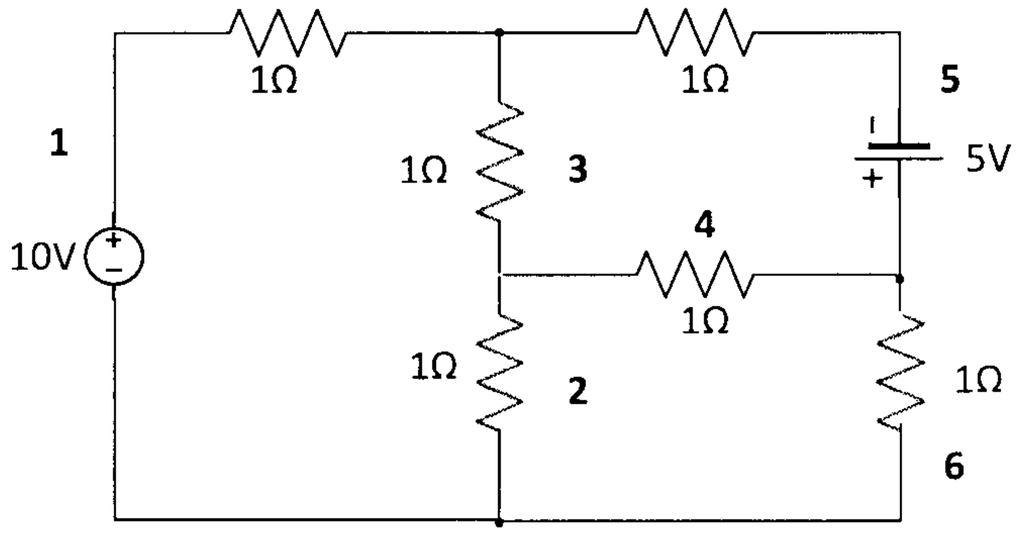
10 a) State reciprocity theorem. Verify reciprocity theorem for the circuit given below. (5)



b) Draw the oriented graph for the reduced Incidence matrix given below. (5)

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

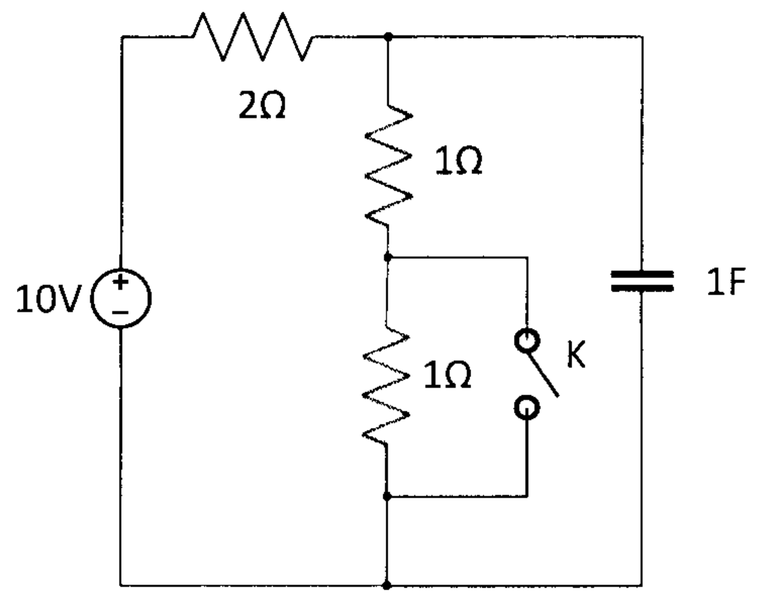
11 For the network shown in the figure write down the cut-set matrix and determine all branch voltages. (10)



PART C

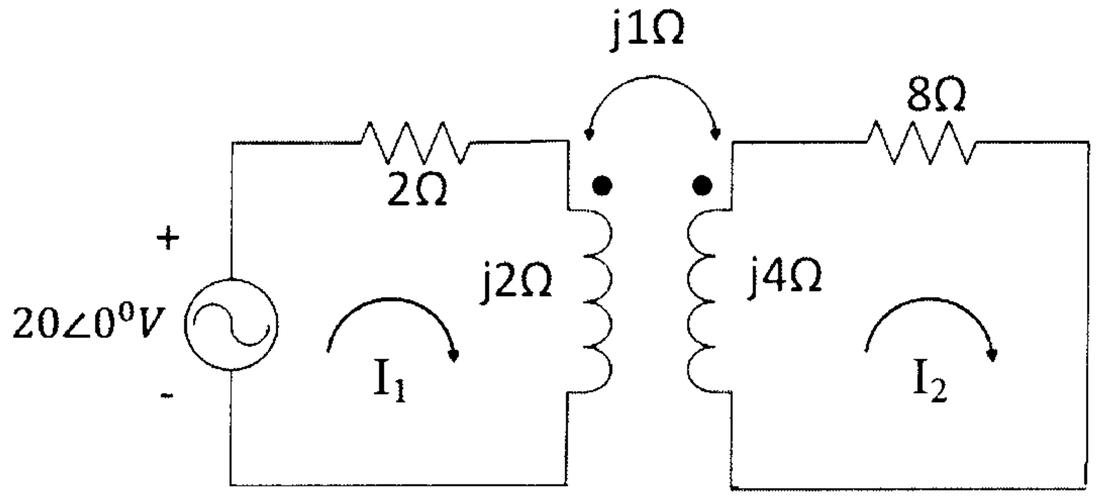
Answer any two full questions, each carries10 marks.

12 The circuit shown in the figure is initially at steady state, with the switch K opened. If the switch is closed at time t = 0, determine the expression for the voltage across the capacitor for t ≥ 0. Also find its final steady state value. (10)



13 a) A series RL circuit with R = 10Ω and L = 2H is connected to a 20V DC supply at time $t = 0$. Plot the variation of inductor current and voltage across the resistor for t ≥ 0 by deriving the expression for the same. (5)

b) Determine the loop current I_2 in the circuit given below. (5)



14 A series RLC circuit with R = 5Ω, L = 1H and C = 0.25F is connected to a 10V DC supply at time $t = 0$. Determine the expression for (i) the current $i(t)$ (10)

through the circuit and (ii) voltage across the capacitor v(t). Use Laplace transform technique.

PART D

Answer any two full questions, each carries 10 marks.

15 a) The following measurements are taken while conducting an experiment on a two port network. If two such identical networks are connected in parallel, determine the Y parameters of the overall network. (5)

Input port terminals shorted	**Input Port Current**	**Output Port Voltage**	**Output Port Current**
	−2A	10V	5A
Output port terminals shorted	**Input Port Voltage**	**Input Port Current**	**Output Port Current**
	5V	2.5A	−1A

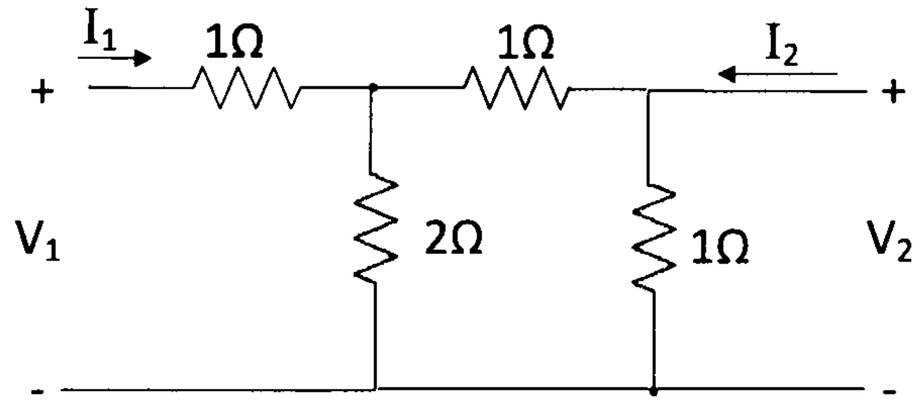
b) The port currents of a two port network are given by (5)

$$I_1 = 4V_1 - 2V_2$$

$$I_2 = -2V_1 + 5V_2$$

Find the equivalent π network.

16 a) Find the transmission parameters of the following network and hence determine whether the network is reciprocal. (5)



b) List any five properties of LC driving point immittance functions. (5)

17 Synthesize the Foster I and II forms of RC network with the following driving point function. (10)

$$Z(s) = \frac{(s+1)(s+6)}{s(s+4)(s+8)}$$

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