Reg No.:_____ **02000EE20109200I** Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S,FE) Examination January 2022 (2015 Scheme)

Course Code: EE201

Course Name: CIRCUITS AND NETWORKS

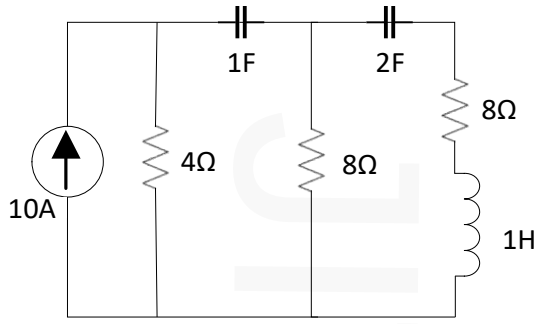
Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 State and explain superposition theorem with an example. (5)

2 For the circuit shown below, draw the oriented graph and find the complete and reduced incident matrices. (5)



3 A series RLC circuit has $L = 1H$ and $C = 1F$. Determine (i) the value of the resistance R so that the circuit becomes critically damped and (ii) the expression for the current if the capacitor has an initial voltage of 10V and is discharged through the resistor and inductor. (5)

4 The current through a 2F capacitor is given by the following s-domain equation. (5)

$$I(s) = \frac{2s + 4}{s^2 + 4s + 3}$$

Determine the voltage across the capacitor, $v(t)$.

5 Derive the conditions of symmetry and reciprocity of a two port network in terms of transmission parameters. (5)

6 A two-port network 'A' has $[Z]_A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ and another two port network 'B' has $[Y]_B = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$. If the two networks A and B are connected in series, find the Z parameters of the overall network. (5)

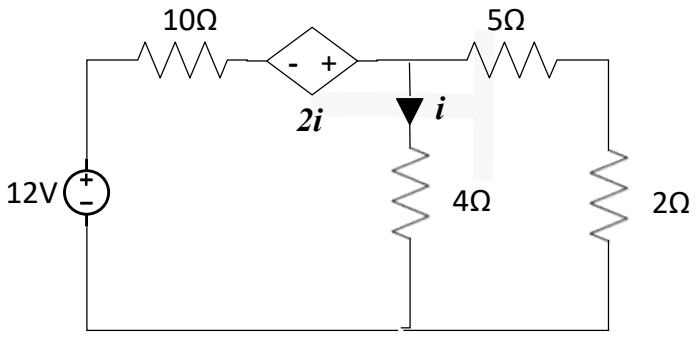
7 Test whether the polynomial $s^4 + 2s^3 + 6s^2 + 3s + 4$ is Hurwitz or not. (5)

8 What are the properties of RC driving point immittance? (5)

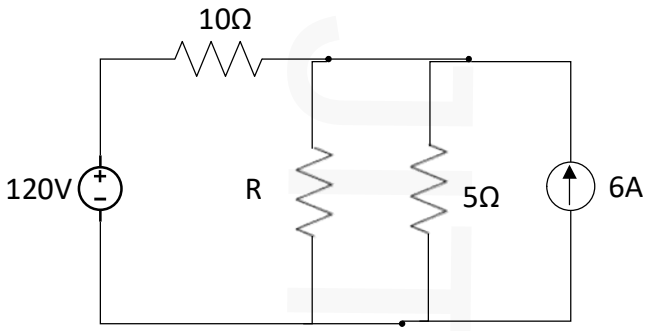
PART B

Answer any two full questions, each carries 10 marks.

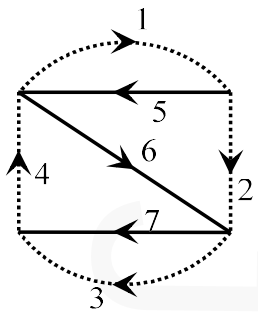
9 For the circuit shown in the figure, determine the power dissipated in the 2Ω resistance using Thevenin's theorem. (10)



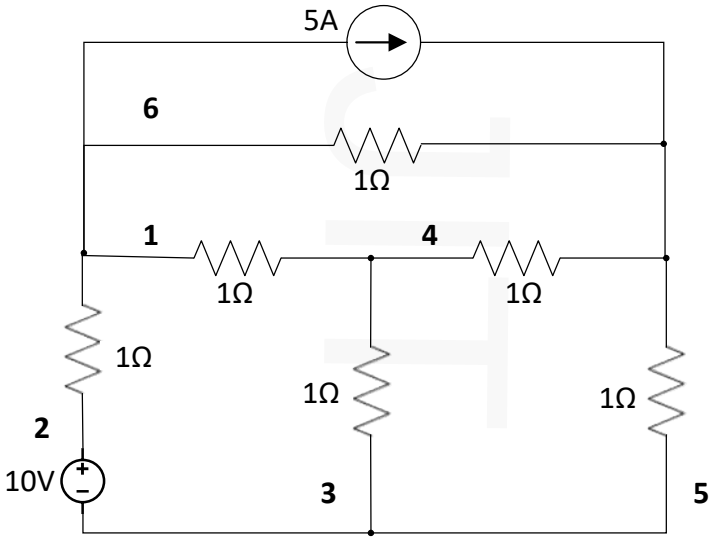
10 a) Calculate the value of the resistance R which will absorb maximum power from the circuit shown in the figure. (5)



b) Determine tie set matrix B for the oriented graph shown in figure below selecting $\{5, 6, 7\}$ as tree. (5)



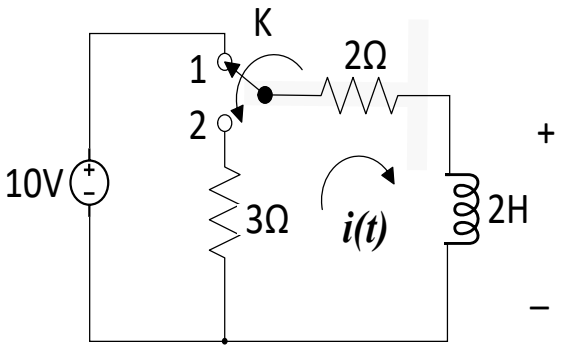
11 For the network given below, draw the oriented graph, write the tie-set matrix and hence obtain the equilibrium equation on loop basis. Calculate the values of branch currents and hence find the current supplied by the 10V source. (10)



PART C

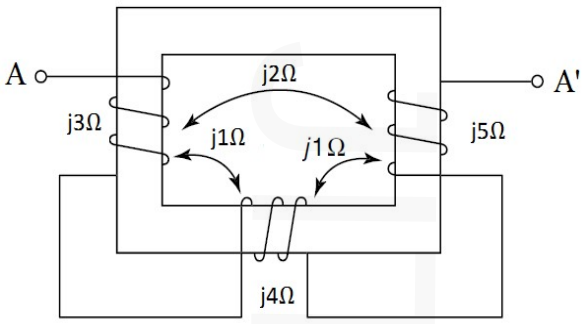
Answer any two full questions, each carries 10 marks.

12 In the circuit shown below, the switch was initially at position 1 and the steady state condition is reached. At $t = 0$, the switch is changed to position 2. Determine (i) the current through the inductor $i(t)$, (ii) voltage across the inductor immediately after the switching operation and (iii) rate of decay of the current at $t = 1$ second. (10)

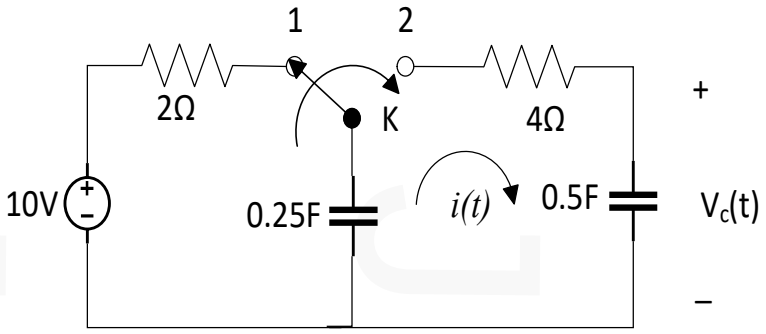


13 a) A resistor R and a 1F capacitor is connected in series with a 50V DC supply. Determine the value of the resistance R if the voltage across the capacitor reaches 50% of its steady state value in 5 seconds. (5)

b) Obtain the dotted equivalent circuit of the network shown in figure and then determine the net inductive reactance. (5)



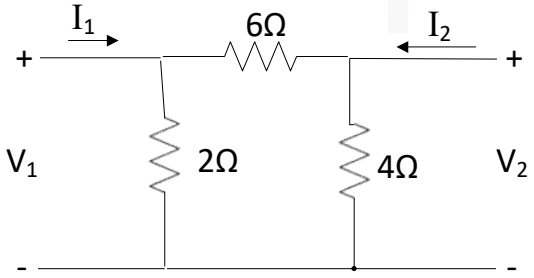
14 For the circuit shown below, determine the current $i(t)$ and the voltage $v_c(t)$ if the switch K, which was initially at position 1 for a long time, is changed to position 2 at time $t = 0$. Use Laplace transform technique. (10)



PART D

Answer any two full questions, each carries 10 marks.

15 a) Find the hybrid parameters of the network shown in the figure. (5)

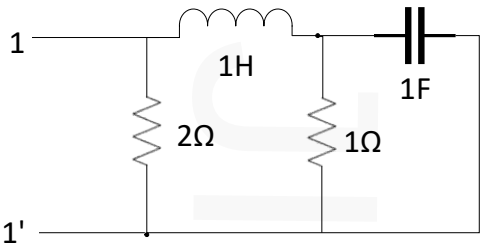


b) Find the equivalent T network of a two port network represented by the following equations. (5)

$$V_1 = 2I_1 + I_2$$

$$V_2 = I_1 + 3I_2$$

16 a) Find the driving point impedance of the network given below. (5)



b) Find the Foster I form of realisation of the following RC impedance function. (5)

$$Z(s) = \frac{(s+1)(s+5)}{s(s+2)(s+6)}$$

17 The driving point impedance of a one port LC network is given below. Obtain the first and second Cauer form of equivalent networks. (10)

$$Z(s) = \frac{10s^4 + 12s^2 + 1}{2s^3 + 2s}$$

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