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080EET201122006

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Examination December 2020 (2019 Scheme)

Course Code: EET201

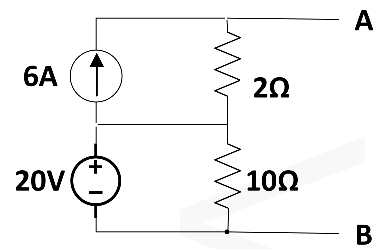
Course Name: CIRCUITS AND NETWORKS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1. State and explain maximum power transfer theorem in DC circuits. (3)
2. Replace the network given below with a single current source and a resistor. (3)



3. Explain the classification of series RLC circuits based on damping ratio. (3)
4. Obtain the expression for the voltage across a capacitor discharging through a resistor of resistance R. Assume that the initial voltage of the capacitor is V_0. (3)
5. Determine the voltage $v(t)$ across a 2Ω resistor, if the current is given by,. (3)

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

6. Derive the s-domain equivalent circuit of a capacitor having an initial voltage of V_0. (3)
7. Explain the phenomenon of neutral shift in three phase 3 - wire systems. (3)
8. Derive an expression for the Q- factor of series resonant circuits. (3)
9. Express ABCD parameters in terms of Z parameters. (3)
10. Determine whether the two port network represented by the following network equations is reciprocal. (3)

$$V_1 = 3V_2 - 2I_2$$
$$I_1 = 4V_2 - 3I_2$$

PART B

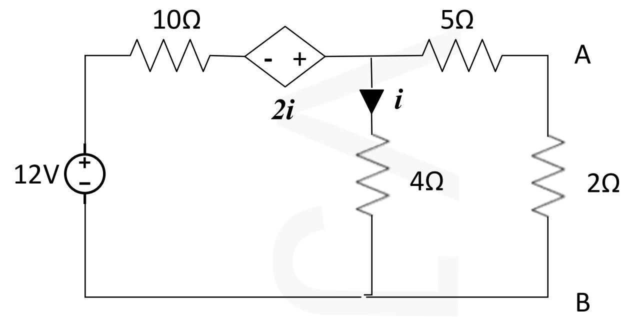
Answer any one full question from each module. Each question carries 14 marks

Module 1

11 For the network given below,

a) Obtain the Thevenin's equivalent circuit across the terminals A and B. (10)

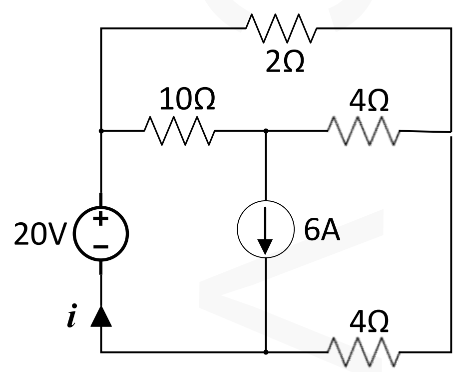
b) Determine the power dissipated in the 2Ω resistance. (4)



12 In the circuit given below,

a) Find the current i using superposition theorem. (10)

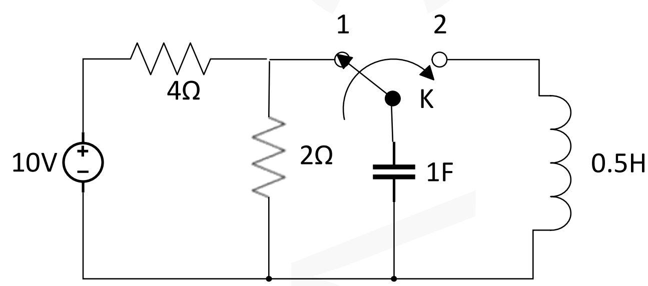
b) Determine the power supplied by the 20V source (4)



Module 2

13 a) A series RL circuit with R = 10Ω is connected to a 50V DC supply at $t = 0$. Determine the value of the inductance L if the current through the inductor attains 50% of its steady state value in 1 seconds. (7)

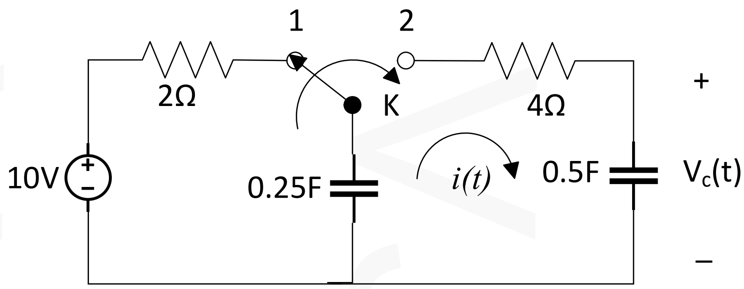
b) The switch K in the circuit given below has been at position 1 for a long time. At t = 0, the switch is moved to position 2. Determine the current flowing through the inductor for t ≥ 0. (7)



14 For the circuit shown below, the switch K, initially at position 1 for a long time, is changed to position 2 at time $t = 0$. Using Laplace transform technique,

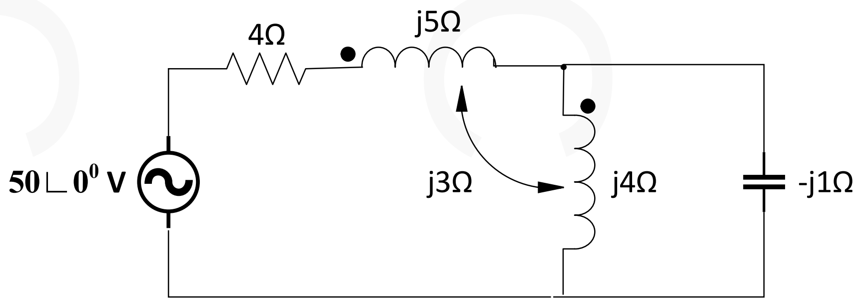
a) Find the circuit current $i(t)$ for $t > 0$. (8)

b) Obtain the expression for the voltage $V_c(t)$ across the 0.5F capacitor. (6)

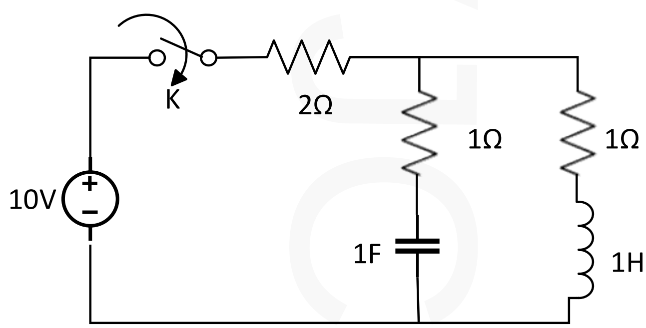


Module 3

15 a) In the circuit given below, find the current flowing through the $-j1\Omega$ capacitor. (10)



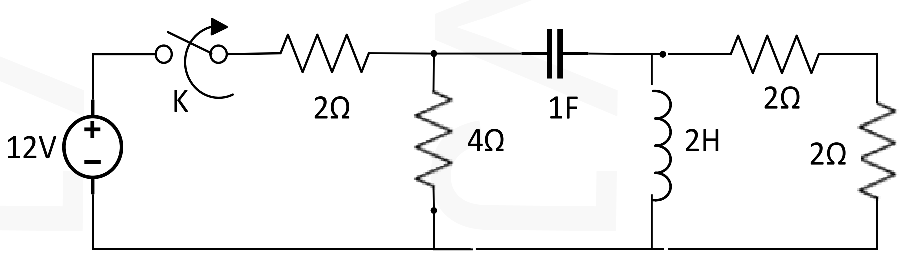
b) In the circuit given below, the switch K is closed at $t = 0$, when the initial current through the inductor is zero and initial voltage on the capacitor is 4 V. Draw the transformed circuit for $t > 0$ and write the mesh equations in s-domain. (4)



16 The switch K in the circuit given below is in closed position for a long time. At $t = 0$, the switch is opened.

a) Determine the transformed circuit for $t > 0$. (4)

b) Find the expression for the voltage across the inductor, for $t > 0$, using nodal analysis. (10)



Module 4

17 A resistor, capacitor and an inductor are connected in series with a 230 V, variable frequency AC source. When the supply frequency is varied to 50Hz, a maximum current of 2A flows and the corresponding voltage across the capacitor is 500 V. Determine,

(i) Resistance, inductance and capacitance of the circuit. (6)

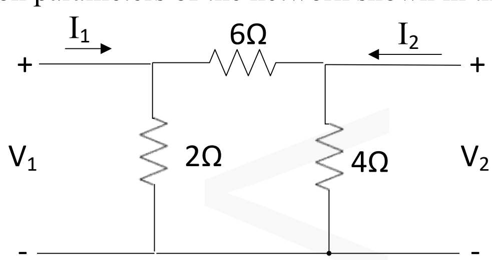
(ii) Q- factor and bandwidth of the circuit. (4)

(iii)The source frequencies at which the circuit current is $\frac{1}{\sqrt{2}}$ times the maximum current. (4)

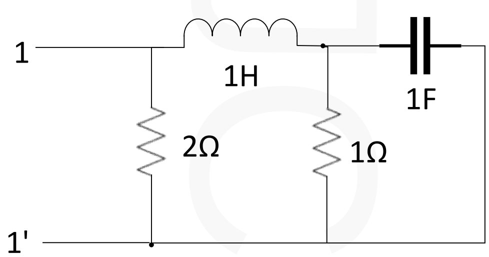
18 A 400 V, three-phase supply feeds an unbalanced three-wire, star-connected load. The branch impedances of the load are $Z_R = 10\Omega$, $Z_Y = -j5\Omega$ and $Z_B = j15\Omega$. Calculate the line currents. (14)

Module 5

19 a) Find the transmission parameters of the network shown in the figure. (8)



b) Find the driving point impedance of the network given below. (6)



20 a) Discuss the series and cascade interconnection of two port networks. (8)

b) The Y parameters of a two port network are $Y_{11} = 3\mho$, $Y_{12} = -1\mho$, $Y_{21} = -1\mho$ and $Y_{22} = 2\mho$. Determine the equivalent T-network. (6)

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