

Course Code: EET201**Course Name: CIRCUITS AND NETWORKS**

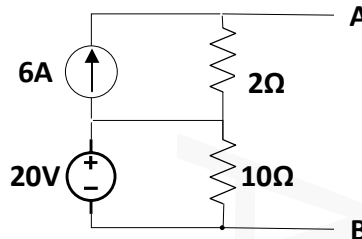
Max. Marks: 100

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)

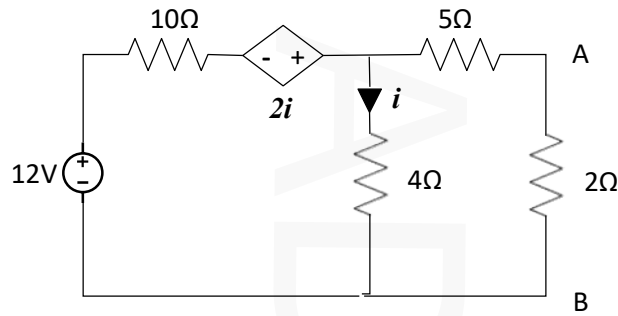
$$V_1 = 3V_2 - 2I_2$$

$$I_1 = 4V_2 - 3I_2$$

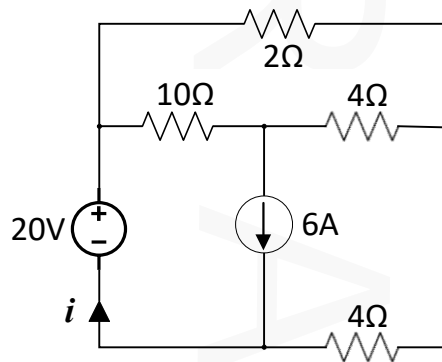
PART B*Answer any one full question from each module. Each question carries 14 marks***Module 1**

- 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)

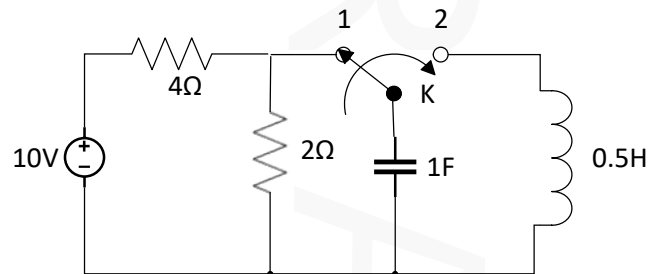


- 12 In the circuit given below,
 a) Find the current i using superposition theorem. (10)
 b) Determine the power supplied by the 20V source (4)

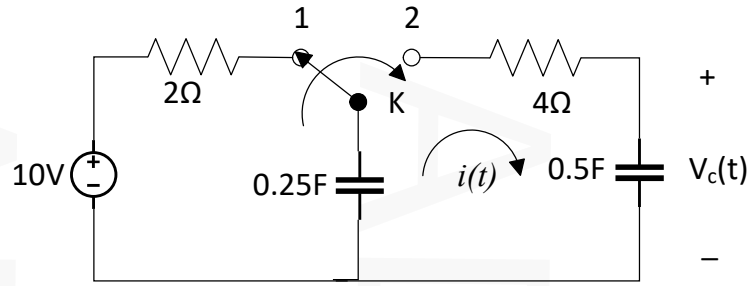


Module 2

- 13 a) A series RL circuit with $R = 10\Omega$ 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 $t \geq 0$. (7)

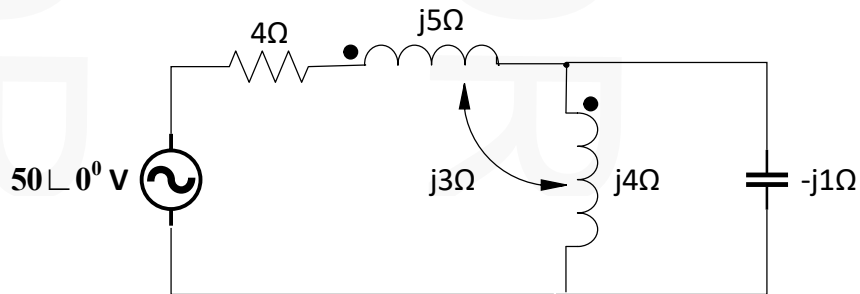


- 14 For the circuit shown below, the switch K , initially at position 1 for a long time, is changed to position 2 at time $t = 0$. Using Laplace transform technique,
 a) Find the circuit current $i(t)$ for $t > 0$. (8)
 b) Obtain the expression for the voltage $V_c(t)$ across the 0.5F capacitor. (6)

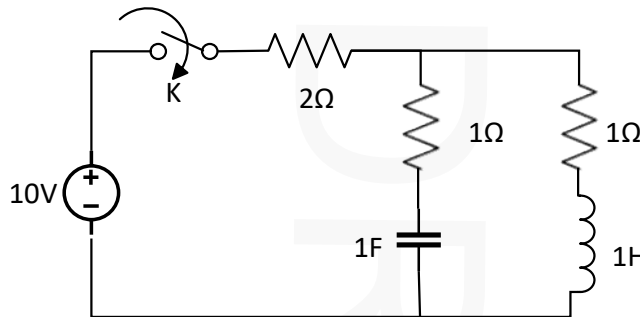


Module 3

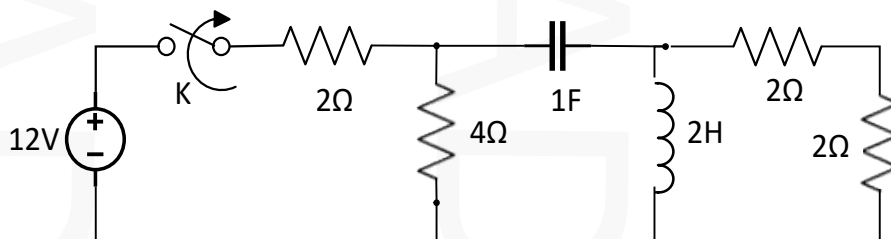
- 15 a) In the circuit given below, find the current flowing through the $-j1\Omega$ capacitor. (10)



- 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)

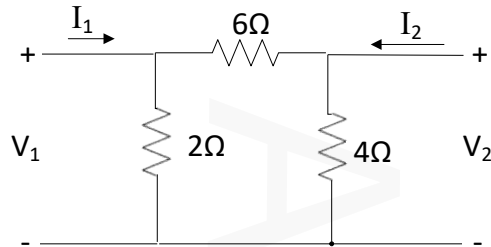


Module 4

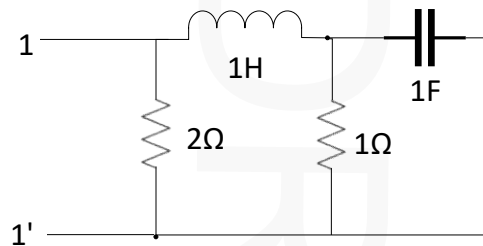
- 17 A resistor, capacitor and an inductor are connected in series with a 230 V, variable frequency AC source. When the supply frequency is varied to 50Hz, a maximum current of 2A flows and the corresponding voltage across the capacitor is 500 V. Determine,
- (i) Resistance, inductance and capacitance 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 $Y_{11} = 3\text{U}$, $Y_{12} = -1\text{U}$, $Y_{21} = -1\text{U}$ and $Y_{22} = 2\text{U}$. Determine the equivalent T-network. (6)
