Reg No.:_____ Name:_____

0800EET201122005

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: EET201

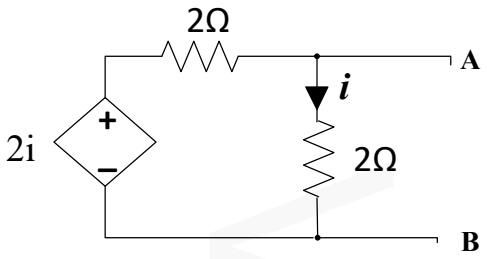
Course Name: CIRCUITS AND NETWORKS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1. State and explain reciprocity theorem using an example. (3)
2. Determine the Norton's equivalent circuit of the following network. (3)



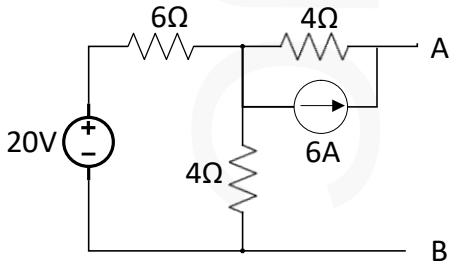
3. Define time constant of a circuit. Illustrate and explain does time constant affect the charging time of the capacitor in series RC circuits connected to a DC source? (3)
4. Derive the expression for the current in a series RL circuit when connected to a DC source of voltage V, at time $t = 0$. Assume zero initial conditions. (3)
5. Obtain the transfer function of a typical series RLC circuit. Take the voltage across the capacitor as the output variable. (3)
6. Define coefficient of coupling in coupled circuits. What are its maximum and minimum values? (3)
7. A series RLC circuit with $R = 10\Omega$, $L = 2H$ and $C = 0.5F$ is connected to a 230V, variable frequency AC source. Determine the frequency of the source at which the circuit current is maximum. Also find the maximum current. (3)
8. Describe the variation of the impedance, power factor and current as a function of frequency in a series resonant circuit. (3)
9. What are h-parameters? Why are they called hybrid parameters? (3)
10. Show that the overall T-parameter matrix of two cascaded 2-port networks is the product of the T-parameter matrix of the individual networks. (3)

PART B

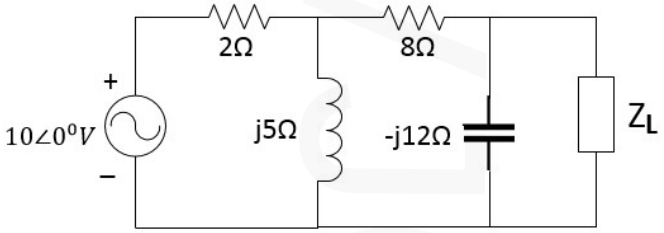
Answer any one full question from each module. Each question carries 14 marks

Module 1

11. For the network given below,
    a) Find the Thevenin's equivalent circuit across the terminals A and B. (10)
    b) Determine the power dissipated in a 10Ω resistance when it is connected across the terminals A and B. (4)

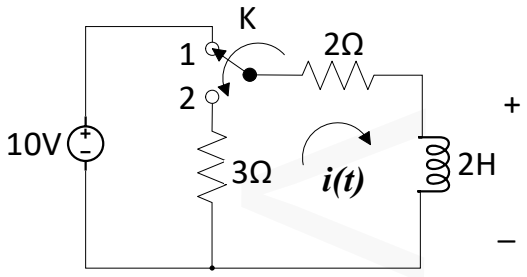


12. In the circuit given below,
    a) Determine the value of the load impedance for maximum power transferred by the source to the load. (12)
    b) Find the maximum power transferred. (2)



Module 2

13. a) 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 the expression for the current $i(t)$, for $t > 0$. (8)

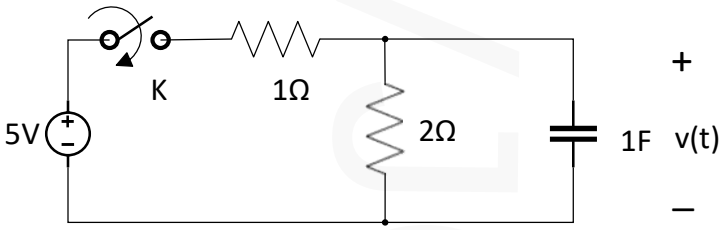


    b) A 0.25F capacitor with an initial voltage of 10V is connected across a coil of 5Ω resistance and 1H inductance, at time $t = 0$. Determine the expression for the current through the coil for $t > 0$. (6)

14. In the circuit given below, the switch K is closed at $t = 0$.

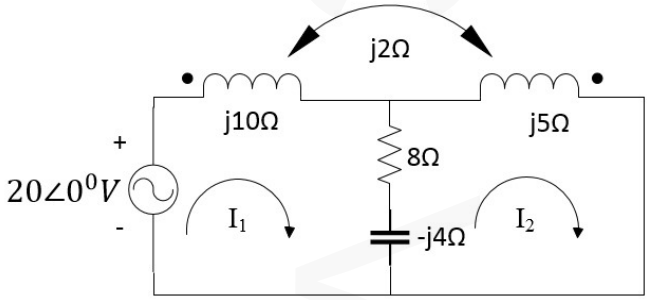
a) Determine the expression for the voltage across the capacitor, $v(t)$ for $t > 0$. (10)

b) Calculate the value of $v(t)$ at $t = 1$ seconds and its final steady state value. (4)

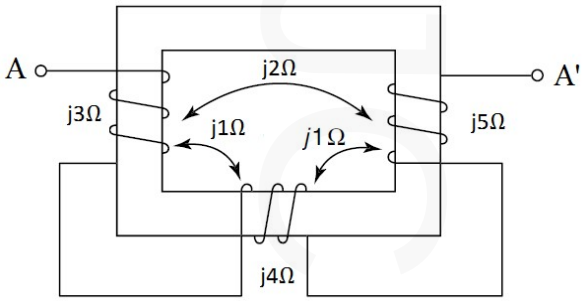


Module 3

15. a) Obtain the conductively coupled equivalent circuit for the network given below. (7)
Also write the mesh equations for the equivalent circuit.



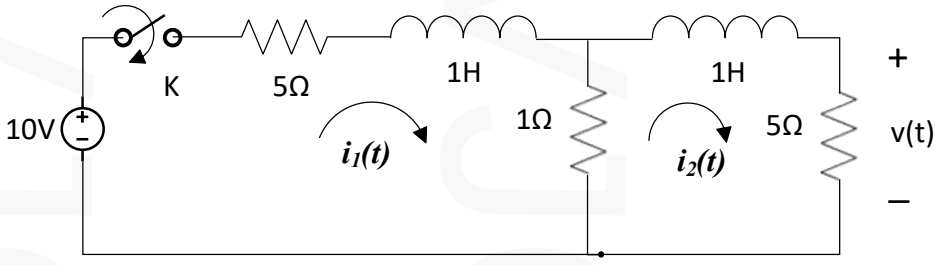
b) If the network given below is connected across a 230V, 50Hz AC source, (7)
determine the current supplied by the source.



16. The switch K in the circuit given below is closed at $t = 0$.

a) Determine the transformed circuit for $t > 0$. Assume zero initial conditions. (4)

b) Find the time domain expression for the voltage v(t) across the 5Ω resistor for (10)
$t > 0$. Use mesh analysis.



Module 4

17. A 3-phase, 3-wire, 240V system supplies a delta-connected load in which $Z_{AB} = 25\angle 90^0\Omega, Z_{BC} = 15\angle 30^0\Omega$ and $Z_{CA} = 20\angle 0^0\Omega$. Determine the phase currents, line currents and total power consumed by the load. (14)

18. A 3-phase, 400V, 4-wire system has a star connected load with $Z_A = 20\Omega$, $Z_B = 15 + j10\Omega$ and $Z_C = j5\Omega$. Find the line currents, current through the neutral conductor and the total power consumed by the load. (14)

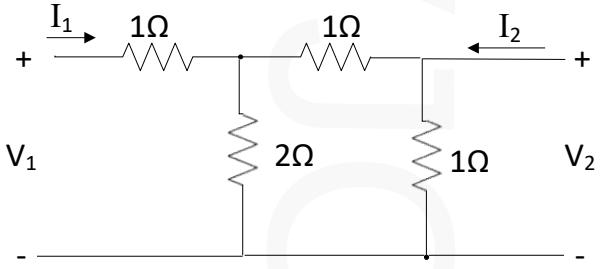
Module 5

19. a) 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. (7)

b) Find the equivalent π network of a two port network represented by the following equations. (7)

$$V_1 = 2I_1 + I_2$$
$$V_2 = I_1 + 3I_2$$

20. a) Find the h-parameters of the following two port network. (8)



b) Derive the conditions of symmetry and reciprocity of a two port network in terms of ABCD parameters. (6)