PRESIDENCY UNIVERSITY
BENGALURU

SET B

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester I - 2023
Course Code : ECE2004
Course Name : Network Theory
Program : B.Tech.

Date : 17-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

**ANSWER ALL THE QUESTIONS**   **5 X 2M = 10M**

1. What are the sequential steps involved in determining the Thevenin equivalent resistance and Thevenin equivalent voltage of a complex electrical circuit?

(CO1) [Knowledge]

2. In determining open circuit impedance parameters or Z Parameters, among V1, V2, I1, I2, which of the following are
dependent variables? Mention the equations for the Z Parameters.

(CO1) [Knowledge]

3. We know that the current in a closed loop is a function of voltage and resistance pertaining to that loop. Define Kirchoff's voltage law along with the mathematical equation by taking 2 loop network as an example

(CO2) [Knowledge]

4. How do ideal and practical current sources differ in their behavior within an electrical circuit, and what are the key distinctions between the theoretical model of an ideal current source and the real-world characteristics of a practical current source?

(CO3) [Knowledge]

5. Voltage and current sources are the active elements in networks. They provide energy to the network elements. Sometimes it may be necessary to transform voltage sources into current sources and vice versa. Mr Ram is having a current source of 150 amperes with a shunt resistance of 1000 ohms. Calculate the voltage?

(CO4) [Knowledge]

**ANSWER ALL THE QUESTIONS**   **5 X 10M = 50M**

6. Consider a circuit with a switch, denoted as "K," that is changed from position 1 to position 2 at t=0. Assume that the circuit has reached a steady-state condition in position 1. Find the values of find the value of i, di/dt , di2/dt2 at t=0+ after the switch has been moved to position 2.
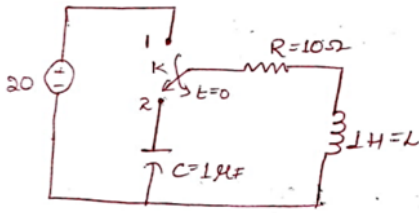
   (CO5,CO4,CO3,CO2,CO1) [Comprehension]

7. Hybrid parameters (also known as h parameters) are known as 'hybrid' parameters as they use Z and Y parameter , voltage ratio, and current ratios to represent the relationship between voltage and current in a two port network.Find h11, h12, h21, and h22
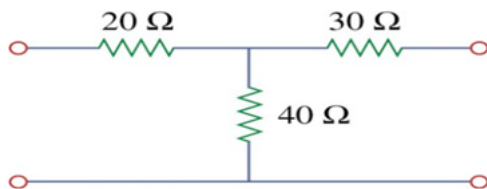
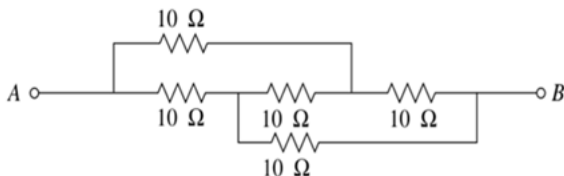   (CO2) [Comprehension]

8. Superposition theorem states that in any linear, bilateral network where more than one source is present, the response across any element in the circuit is the sum of the responses obtained from each source considered separately.Find out the value of v using Superposition theorem.
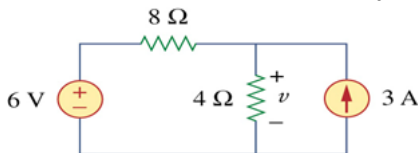
                                                                    (CO3) [Comprehension]

9. The equivalent resistance represents the total resistance that could replace the entire circuit between points A and B without changing the overall current or voltage characteristics.

                                                                    (CO4) [Comprehension]

10. A wheatstone bridge ABCD is arranged as follows AB is equals to 20 ohm BC is equal to 50 ohm and CD is equals to 60 ohm and DA is equals to 80 ohm . A 20 volt battery of internal resistance 25 ohm is connected between points A and C with A being positive. A galvanometer of resistance 40 ohm is connected between B and D. Find Galvanometer current.

                                                                    (CO3) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS   **2 X 20M = 40M**

11. a) The Z parameters, or impedance parameters, of a two-port network are represented by a 2×2 impedance matrix. This matrix is also known as the open-circuit parameter consisting of $Z11,Z12,Z21$& $Z22$,Derive the 4 equations for the same and also draw the circuit diagram.
b)Identify and find the impedance parameters or Z parameters for the circuit shown below and also find out $Z11,Z12,Z21$& $Z22$ .What is the matrix form of Z-parameters?
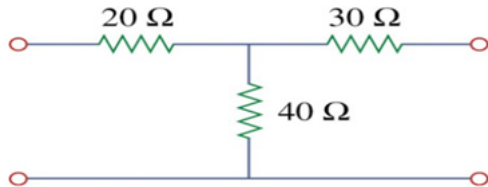
(CO5,CO4,CO3,CO1,CO2) [Application]

12. a)Thevenin's Theorem is a fundamental principle in electrical circuit analysis that simplifies the analysis of complex linear circuits. It states that any linear circuit containing independent and dependent voltage and current sources can be replaced by an equivalent circuit consisting of a single voltage source Vth in series with a single impedance Rth. This equivalent circuit, known as the Thevenin equivalent circuit,Find out Thevenin equivalent circuit for the given network
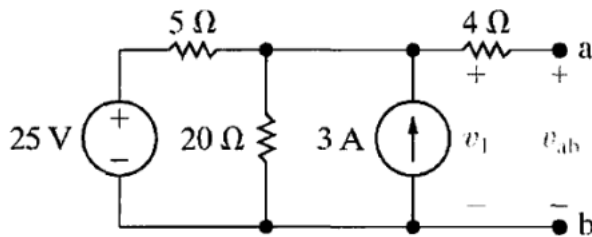
b) Norton's Theorem is another essential principle in electrical circuit analysis, similar to Thevenin's Theorem. It states that any linear electrical network can be replaced with an equivalent circuit comprising a current source IN in parallel with a single impedance RN . This equivalent circuit, known as the Norton equivalent circuit,Find out Nortons equivalent circuit for the given network

(CO2,CO1,CO3,CO4,CO5) [Application]