



**PRESIDENCY UNIVERSITY  
BENGALURU**

**SET A**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JAN 2024**

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

**Date :** 11 -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**

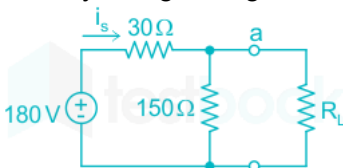
**ANSWER ALL THE QUESTIONS**

**5 X 2M = 10M**

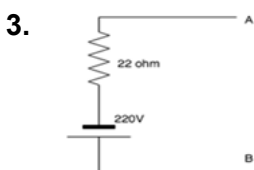
1. In determining open circuit impedance parameters or Z Parameters, among  $V_1$ ,  $V_2$ ,  $I_1$ ,  $I_2$ , which of the following are dependent variables? Mention the equations for the Z Parameters.

(CO1) [Knowledge]

2. A voltage divider is a simple electrical circuit that produces an output voltage that is a fraction of its input voltage. It typically consists of two resistors connected in series across a voltage source, and the output voltage is taken from the connection point between the resistors. Calculate voltage across 150 ohm by using voltage divider



(CO1) [Knowledge]



what will the value of the current in amperes once source transformation is applied to the circuit?

(CO2) [Knowledge]

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

(CO3) [Knowledge]

5. Star and Delta are the two basic types of three phase connection. If a balanced star connection of 40 ohm in each branch. Find the equivalent delta resistance.

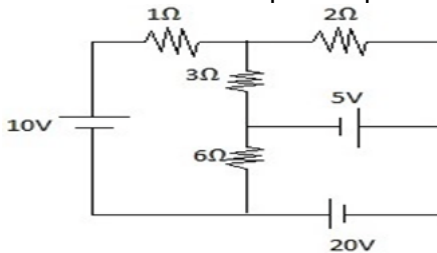
(CO4) [Knowledge]

## PART B

### ANSWER ALL THE QUESTIONS

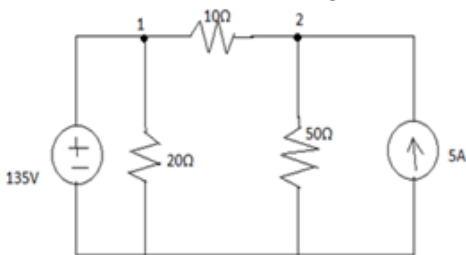
5 X 10M = 50M

6. Mesh analysis involves writing and solving equations based on the loop currents, Kirchhoff's voltage law, and the resistances in the circuit. Using the mesh analysis method, determine the current flowing in each of the three loops in a planar electrical circuit.



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

7. Nodal analysis relies on Kirchhoff's current law (KCL) to write equations based on the sum of currents entering and leaving each node. Utilizing nodal analysis (or the node-voltage method), determine the voltages at nodes 1 and 2 in the electrical circuit. The approach involves identifying the currents at each node and formulating equations to solve for the desired node voltages.

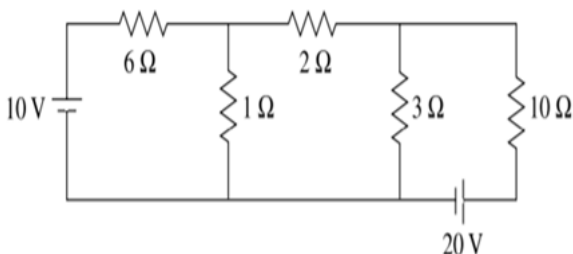


(CO2) [Comprehension]

8. The ABCD parameters, also known as transmission parameters, are another set of parameters commonly used in the analysis of two-port networks in electronics. Derive the 4 equations for A, B, C and D and also draw the circuit diagram.

(CO3) [Comprehension]

9. In the context of mesh analysis for electrical circuits, imagine a circuit with multiple loops formed by interconnected resistors and other components. Each loop has a current flowing through it, and mesh analysis involves applying Kirchhoff's Voltage Law (KVL) to write equations for the voltage drops across each component in the loop. Calculate the current across 2Ω resistor using mesh analysis.



(CO4) [Comprehension]

10. A wheatstone bridge ABCD is arranged as follows AB is equal to 10 ohm BC is equal to 30 ohm and CD is equal to 15 ohm and DA is equal to 20 ohm. A 2 volt battery of internal resistance 2 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 by using KCL and KVL

(CO3) [Comprehension]

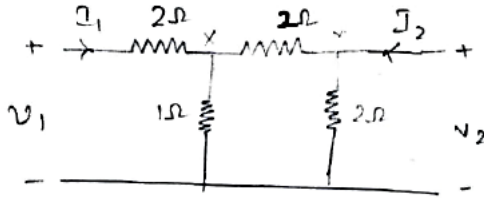
PART C

ANSWER ALL THE QUESTIONS

2 X 20M = 40M

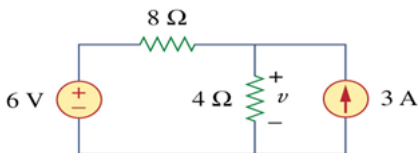
11. 26) a) Admittance is the reciprocal of impedance, and it is a measure of how easily a circuit allows the flow of current. Admittance Parameters are commonly denoted by  $Y_{11}$ ,  $Y_{12}$ ,  $Y_{21}$ , and  $Y_{22}$ . Derive the 4 equations for the same and also draw the circuit diagram.

b) Identify and find the Admittance or Y Parameters  $Y_{11}$ ,  $Y_{12}$ ,  $Y_{21}$ , and  $Y_{22}$  for the circuit shown below

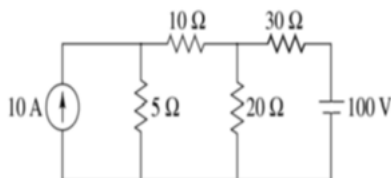


(CO2,CO1,CO3,CO4,CO5) [Application]

12. a) 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  $v$  by using the Superposition theorem.



b) In a network any resistor network can be converted into a single equivalent resistor. Similarly Thevenin's theorem shows us how to simplify a network of resistors and sources. If you have a complicated circuit the theorem shows you how to construct a simple equivalent which consists of a single voltage source in series with a single resistor. Hence the equivalent Thevenin's circuit for the given circuit is.



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