



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
MID TERM EXAMINATION - NOV 2023**

Semester : Semester I - 2023

Course Code : ECE2004

Course Name : Sem I - ECE2004 - Network Theory

Program : B. TECH

Date : 3-NOV-2023

Time : 11:30AM - 1:00PM

Max Marks : 50

Weightage : 25%

Instructions:

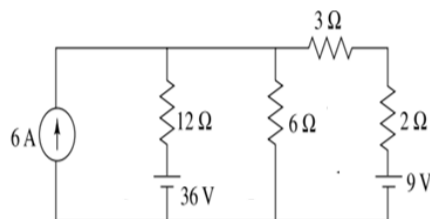
- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

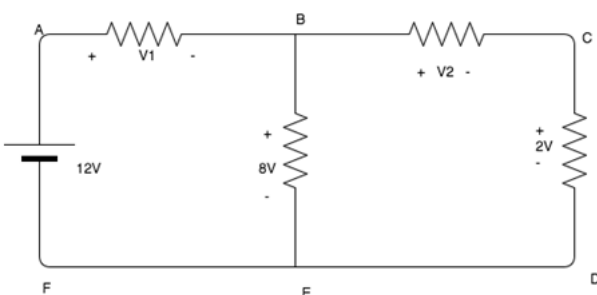
ANSWER ALL THE FIVE QUESTIONS

5 X 2=10M

1. You have a three-phase electrical circuit with three resistors connected in a star configuration (Y-connection). The resistors have the following values:
Resistance of each resistor (R_y) in the star configuration = 10 ohms. Determine the equivalent resistance in the delta (Δ) configuration
(CO1) [Knowledge]
2. Kirchoff's voltage law (KVL) is an important and useful law for analyzing a network. Find the current through 2Ω resistor for the network shown below
(CO1) [Knowledge]



3. Calculate the value of V_1 and V_2 using Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL)?
(CO1) [Knowledge]



(CO1) [Knowledge]

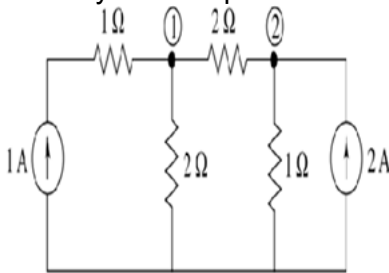
4. You have a parallel plate capacitor with a plate area of 0.01 square meters and a plate separation distance of 0.001 meters. The capacitor is filled with a dielectric material with a relative permittivity (ϵ_r) of 4. If a voltage of 100 volts is applied across the capacitor, calculate the capacitance (C)
(CO1) [Knowledge]
5. A project trainee is working with five voltage sources of 1v,2v,3v,4v and 5v with internal resistances of 1 Ω , 2 Ω , 3 Ω , 4 Ω and 5 Ω respectively connected in parallel. Project trainee wants to have a single equivalent voltage source in series with a resistor. Help the trainee in this problem.
(CO1) [Knowledge]

PART B

ANSWER ALL THE TWO QUESTIONS

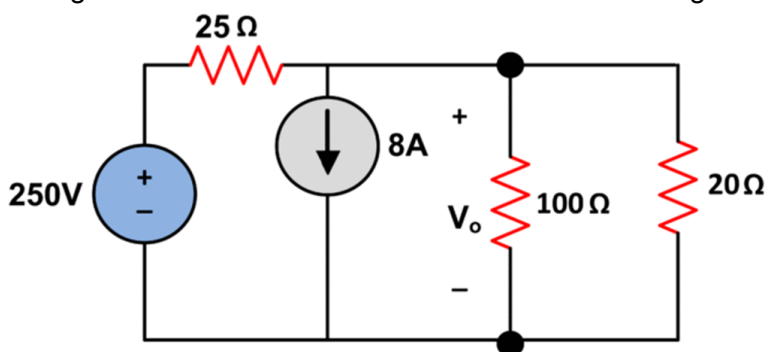
2 X 10 = 20M

6. Nodal analysis is particularly useful for solving complex circuits with multiple components and nodes. It provides a systematic and algebraic method to determine the voltage distribution in a circuit and is widely used in electrical and electronics engineering for circuit design and analysis.using the Node-Voltage Method, determine the voltage values at nodes 1 and 2 in the given circuit by formulating the necessary nodal equations and solving for the unknowns.



(CO1) [Comprehension]

7. A voltage source with a series resistance can be converted into an equivalent current source with a parallel resistance. Conversely, a current source with a parallel resistance can be converted into voltage source with a series resistance. Find V_o using source Transformation Technique



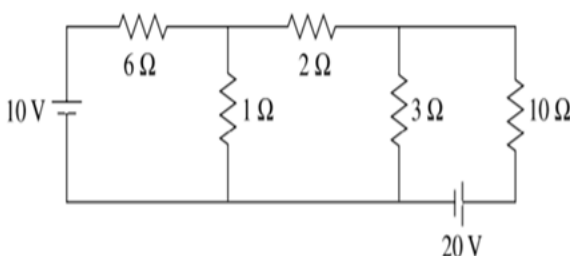
PART C

(CO1) [Comprehension]

ANSWER ALL THE TWO QUESTIONS

2 X 10 = 20M

8. A wheatstone bridge ABCD is arranged as follows AB is equals to 100 ohm BC is equal to 300 ohm and CD is equals to 150 ohm and DA is equals to 200 . A 20 volt battery of internal resistance 20 ohm is connected between points A and C with A being positive. A galvanometer of resistance 50 ohm is connected between B and D. Find Galvanometer current by using KCL and KVL
(CO1) [Application]
9. Mesh analysis, also known as mesh current analysis, is a method used in electrical circuit analysis to determine the currents circulating in various closed loops or "meshes" of a circuit. It is a powerful technique for analyzing both linear and nonlinear electrical circuits.Explain the steps involved in mesh analysis and find the unknown current in the given network



(CO1) [Application]