PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: ECE 2004

Course Name: NETWORK THEORY

Program   : B. Tech

Date: 25-JAN-2023

Time: 01.00 PM to 04.00 PM

Max Marks: 100

Weightage: 50 %

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Scientific and non-programmable calculators are permitted.

*(iii) Answer all Questions*

Part A [Memory Recall Questions]

**Answer all the Questions. Each question carries TWO marks.   (15Qx 2M= 30M)**

1. A conductor is said to have resistance of one ohm if a potential difference of two volt across its terminals causes a current of X ampere to flow through it. What will be the value of X?

(CO1, Knowledge)

2. Inductor stores the kinetic energy of moving electrons in the form of a magnetic field. Energy stored in an inductor is _____   (CO1, Knowledge)

3. In a network consisting of linear resistors and ideal voltage source, if the value of resistors are doubled, then voltage across each resistor _____   (CO1, Knowledge)

4. If a resistor Rx is connected between nodes X and Y, Ry between Y and Z, Rz between X and Z to form a delta connection, then after transformation to star, the resistor at node X is in terms of Rx, Ry and Rz is?   (CO1, Knowledge)

5. Kirchhoff's current law is used to describe how a charge enters and leaves a wire junction point or node on a wire. Find the current i1 in the circuit shown below.
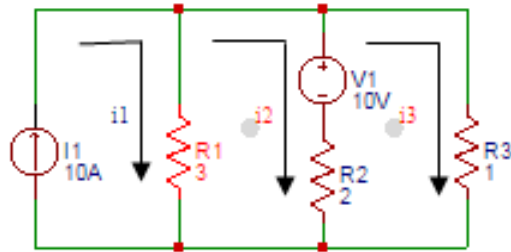
(CO1, Knowledge)

6. In Superposition theorem, while considering a source, all other current sources are_____ and all other voltage sources are _____

(CO2, Knowledge)

7. If there is no current flowing through the inductor at t=0-, the inductor will act as_____ at t=0+, and acts as _____at t=infinity.

(CO4, Knowledge)

8. A network is said to be reciprocal if the ratio of excitation at one port is same, if excitation and response are interchanged. For a two port network of Z parameters, the condition for network to exhibit reciprocity is _____ (CO5, Knowledge)

9. Source transformation is the process of simplifying a circuit solution, especially with mixed sources, by transforming voltage sources into current sources, and vice versa. Determine the equivalent voltage in the circuit. (CO1, Knowledge)
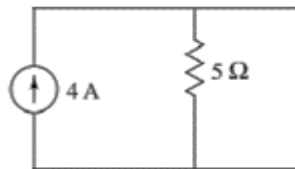
10. When two resistors are connected in a parallel circuit, the current in any branches will be a fraction of the total current (IT)). Express current divider rule for Ix in the circuit shown below. (CO1, Knowledge)
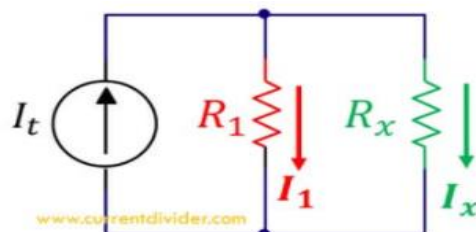
11. An electrical network is an interconnection of electrical components or a model of such an interconnection, consisting of electrical elements. Find the voltage between A & B terminal. (CO1, Knowledge)
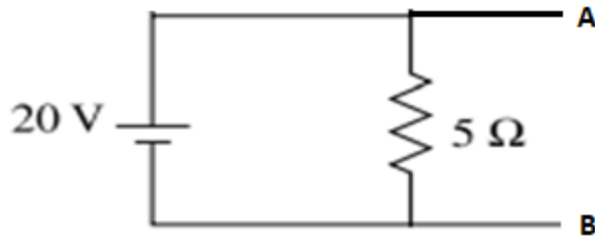

12. Maximum power transfer theorem states that the DC voltage source will deliver maximum power to the variable load resistor only when the load resistance is equal to the _____ resistance. The amount of power dissipated across the load resistor is _____. (CO2, Knowledge)

13. In any electrical network, when we use superposition therorem, the independent voltage sources are represented by their internal resistance if given or simply with zero resistance, i.e., _____ if internal resistances are not mentioned. The independent current sources are represented by infinite resistance, i.e.,_____ (CO2, Knowledge)

14. A two port network has two pairs of terminals, one pair at the input known as input port and one pair at output known as output port. Write the equation for open circuit impedance. (CO4, Knowledge)

15. The hybrid parameters of a two port network may be defined by expressing the voltage of input port V1 and current of output port I2 interms of current of input port I1 and voltage of output port V2. Obtain the equations for condition for reciprocity and symmetry. (CO4, Knowledge)

Part B [Thought Provoking Questions]

**Answer all Questions. Each question carries TEN marks.** (4Qx10M=40M)

16. In hybrid parameter circuit, voltage gain, current gain, impedance and admittance are used to determine relation between current and voltage of two port network. In the two port network shown below, identify h parameter from the following data

a) With the output port short-circuited:V1=25V, I1=1A, I2=2A

b) With the input port short-circuited:V1=10V, V2=50V, I2=2A

(CO5, Comprehension)
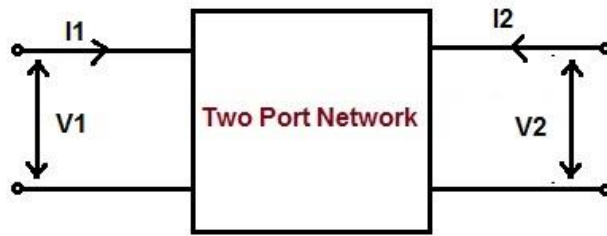
17. Z parameters are also known as impedance parameters or open-circuit parameters. These properties used in electrical engineering to describe the electrical behavior of linear electrical networks and are calculated under open-circuit conditions. Compute the Z parameters for the network shown in given figure.

(CO5, Application)
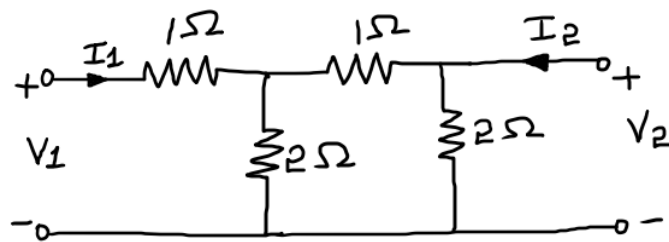
18. In circuit theory, a supernode is a theoretical construct that can be used to solve a circuit. Super nodes containing the reference node have one node voltage variable. For nodal analysis, the super node construct is only required between two non-reference nodes. For the below given figure find nodal voltages by applying the concept of super nodal analysis.

(CO1, Application)
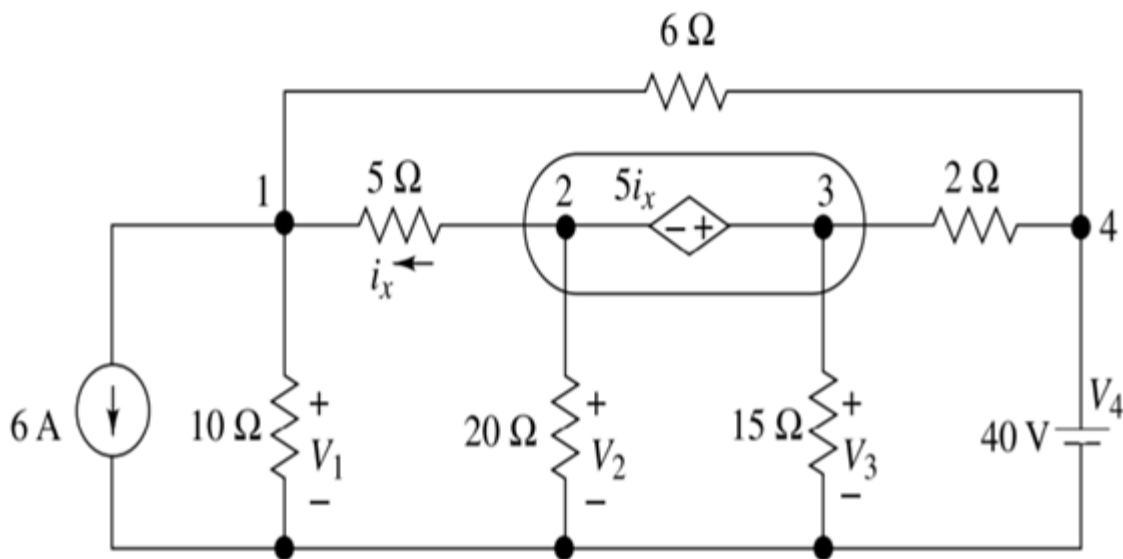
19. Meshes that share a current source with other meshes, none of which contains a current source in the outer loop or a supermesh forms when two meshes have a common current source. Determine the current in 5Ω resistor for the circuit shown in figure.

(CO1, Comprehension)
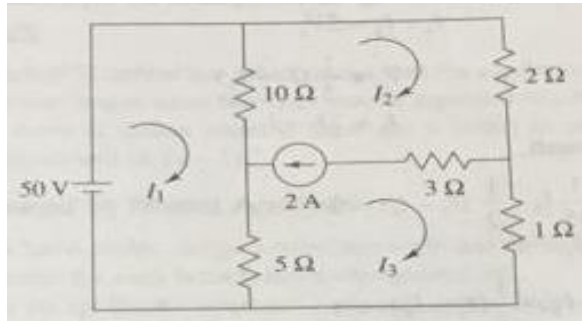
Part C [Problem Solving Questions]

Answer all Questions. Each question carries FIFTEEN marks.   (2Qx15M=30M)

20. Nodal analysis is used to determine node voltages by solving KCL equations for the incoming and outgoing currents at each node. Mesh analysis is used to determine currents in a circuit loop by solving KVL equations for the voltages across each component in the loop. Calculate the current across 2Ω resistor using mesh analysis and verify the same using nodal analysis.   (CO1, Application)
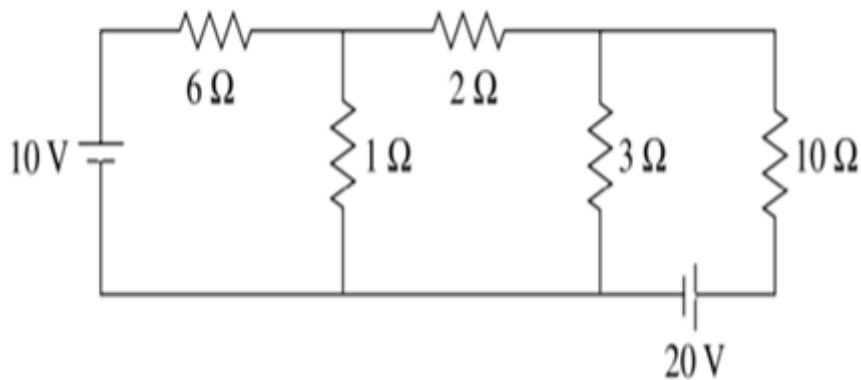
21. Initial conditions are used to find the value of arbitrary constants that appear in the general solution of differential equations written for a given network. In the network shown the switch is closed at t=0. With the capacitor uncharged, infer the values for i, di/dt and d^2i/dt^2 at t=0+.   (CO4, Comprehension)