



Shirpur Education Society's
R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR
 An Autonomous Institute

(Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere)



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 (स्वायत्त महाविद्यालय)

Programme: B.TECH (AIML)/B.TECH (COMP/B.TECH (CSEDS)/ (MECH)

Year: I/Semester I (Exam Year: 2023-2024)

Subject: Basic Electrical Engineering and Digital Electronics

Max Marks: 60

Date: 16 Jan 2024

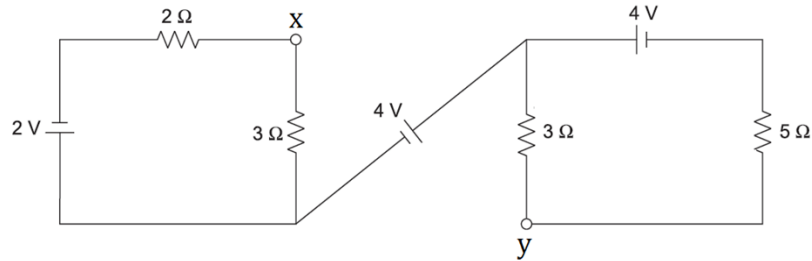
Time: 02:30 pm - 04:30 pm (02:00 Hrs.)

END SEMESTER EXAMINATION ODD SEM I (Acad. Year: 2023-2024)

Instructions:

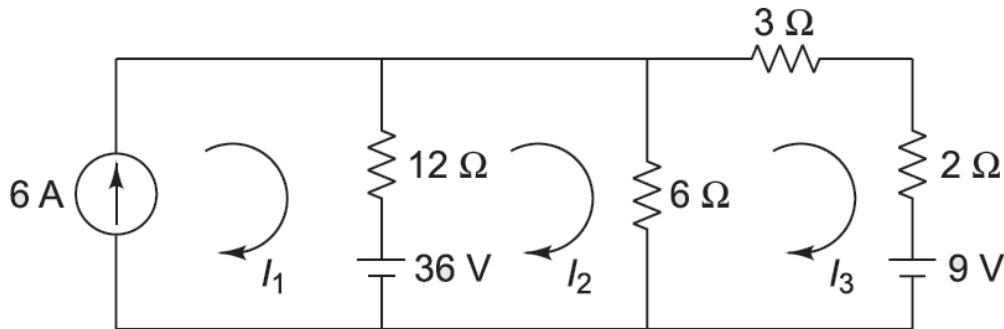
1. This question paper contains 3 pages
2. Answer to each new question to be started on a fresh page.
3. Figure in right hand side indicates full marks
4. All questions are compulsory.

- | | |
|--|----|
| 1. 1 | 15 |
| a. | 5 |
| i. What is the potential difference between points x and y in the network? | 5 |



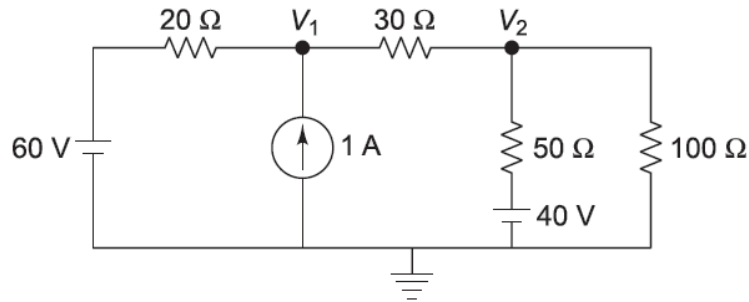
----- OR -----

- | | |
|---|---|
| ii. Find the value of current flowing through the 2 Ω resistor using Mesh analysis. | 5 |
|---|---|



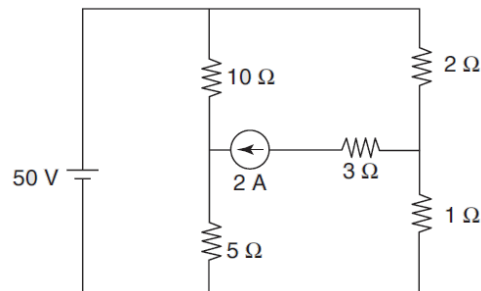
b. 5

I. Calculate the current through $100\ \Omega$ resistor for the network shown using Nodal analysis. 5



----- OR -----

II. Find the current through $5\ \Omega$ resistor of the network shown using Mesh analysis. 5



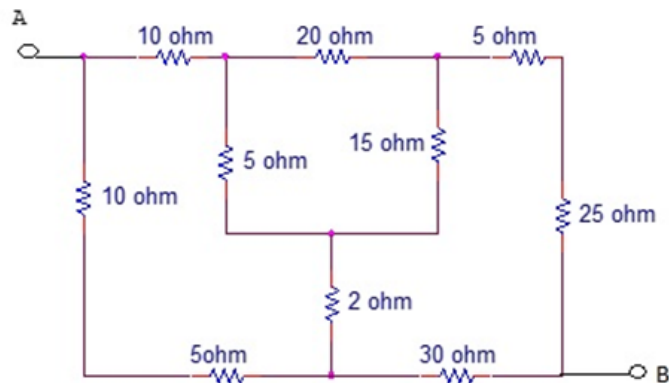
c. Find the resultant of the three voltages. 5

$$e_1 = 20 \sin \omega t, \quad e_2 = 30 \sin (\omega t - \pi/4), \quad e_3 = 40 \cos (\omega t + \pi/6)$$

2. 2 15

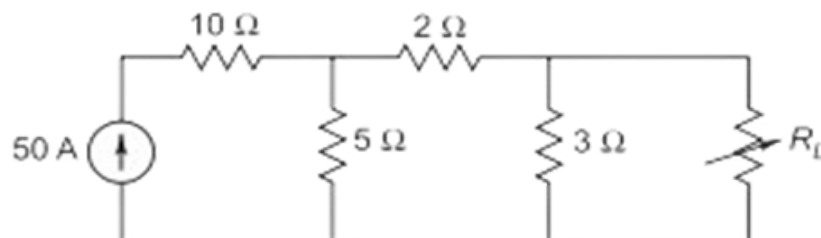
a. 10

i. Derive the expression to convert a Delta network into its equivalent Star network. Also find the equivalent resistance between the terminals A and B in the network shown below. 10



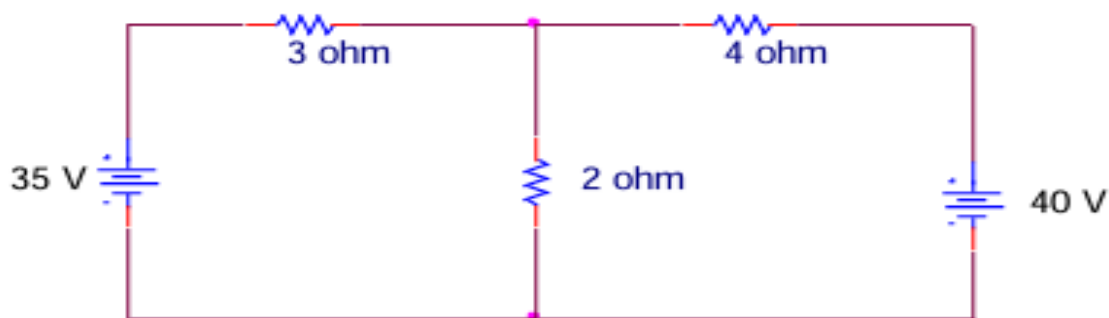
----- OR -----

State and prove the Maximum Power Transfer theorem. Also find the value of the resistor R_L for the maximum power transfer in the circuit and calculate the maximum power. 10



b. For the circuit shown, find the different branch currents using Superposition theorem.

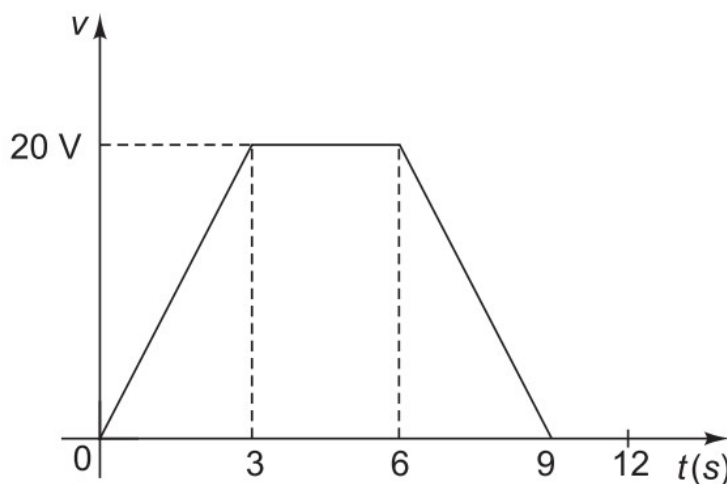
5



3. 3 15

a. Find the average and RMS value of the waveform. Also, find the dissipated power if the voltage is applied to a $10\ \Omega$ resistance.

10



b. 5

1. A voltage $v(t) = 177 \sin(314t + 10^\circ)$ is applied to a circuit. It causes a steady-state current to flow, which is described by $i(t) = 14.14 \sin(314t - 20^\circ)$. Determine the power factor and active power of the circuit.

5

----- OR -----

2. A resistance of $10\ \Omega$ and a pure coil of inductance 31.8 mH are connected in parallel across 200 V , 50 Hz supply. Find the total current and power factor.

5

4. 4 15

a. 5

i. Implement the given Boolean expression using logic gates. 5

i. $F_1 = AB + BC + AC$ ii. $F_2 = (A+B) \cdot (B+C) \cdot (A+C)$

----- OR -----

ii. What do you mean by the Universal gates? Implement the basic gates using only NAND gates. 5

b. Simplify the given Boolean expression. After simplification, implement it using basic gates. 5

$$F = AB + A(B + C) + B(B + C)$$

c. Draw SR Flip-flop. Write its truth table & explain. 5