राजकीय पॉलिटेक्निक महाविद्यालय करौली

विद्युत विभाग

II - Mid term test

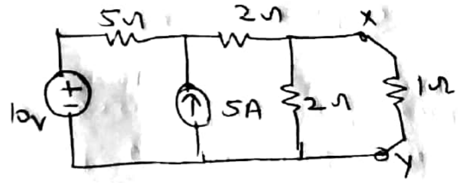
Subject - Electrical Circuit theory

Code - EE 205

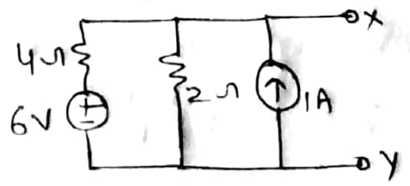
Max Mark - 15   Date - 18/01/2018

Attempt any three question.

Q.1) In fig, find the power loss in 1Ω resistor using Norton's theorem. (05) Marks



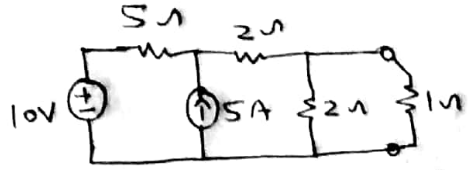
Q.2) Find Millman's equivalent for the left of the terminals x-y as shown in fig. (05) Marks



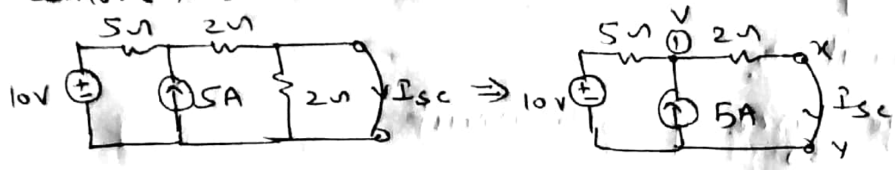
Q.3) In the ckt of fig. find the current through the 5Ω resistor using the principle of superposition. (05) Marks

Q.4) State the thevenin's theorem and explain it. (05) Marks

Q.1)
Ans.1)



remove the 1Ω resistor and short x-y



At node 1

$$\frac{V-10}{5} + I_{sc} = 5 \quad \text{— (1)}$$

$$I_{sc} = \frac{V}{2} \quad \text{— (2)}$$

from eq. (1)

$$\frac{V-10}{5} + \frac{V}{2} = 5$$

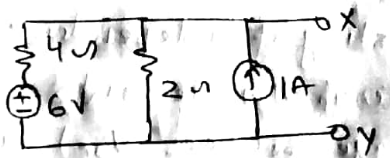
$$0.7V = 7$$

$$V = 10V$$

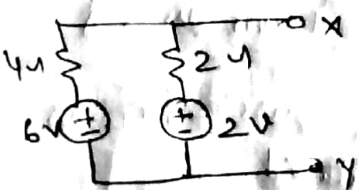
put the value of V in eq. (2)

$$I_{sc} = \frac{10}{2} = 5A$$

Q.2)
Ans.2)



First convert the current source of 1A to voltage source

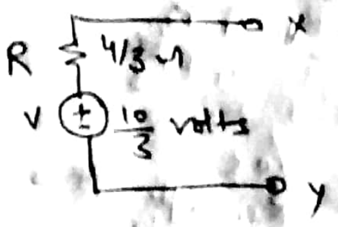


Millman's equivalent voltage

$$V = \frac{V_1 G_1 + V_2 G_2}{G_1 + G_2} = \frac{6 \times \frac{1}{4} + 2 \times \frac{1}{2}}{\frac{1}{4} + \frac{1}{2}}$$

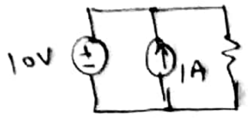
$$= \frac{5}{2} \times \frac{4}{3} = \frac{10}{3} V$$

$$R = \frac{1}{G_1 + G_2} = \frac{1}{\frac{1}{4} + \frac{1}{2}} = \frac{4}{3} \Omega$$



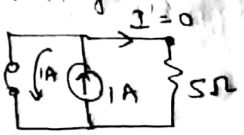
Q.3)

Ans.3)



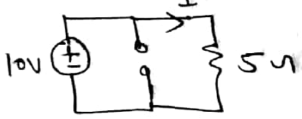
Using superposition

replace voltage source by short circuit



$I' = 0\,A$ (current through 5Ω resistor).

replacing current source by open ckt



$I'' = \frac{10}{5} = 2\,A$

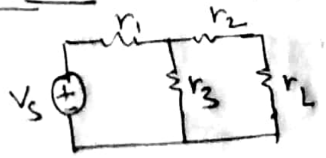
Using superposition

Current through 5Ω resistor $I_5 = I' + I'' = 0 + 2 = \underline{2\,Amp}$

Q.4)

Ans.4) Statement – Any linear active N/w consisting of Independent or dependent voltage and current source and linear bilateral N/w elements can be replaced by an equivalent circuit consisting of voltage source (V_{oc}) and a series resistance (R_{th}).

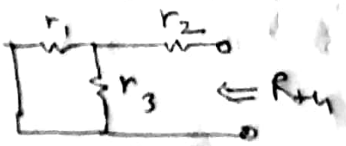
For Exam. – find the thevenin's eq. ckt. as shown in fig.



find eq. voltage source, r_L is removed and V_{oc} is calculated

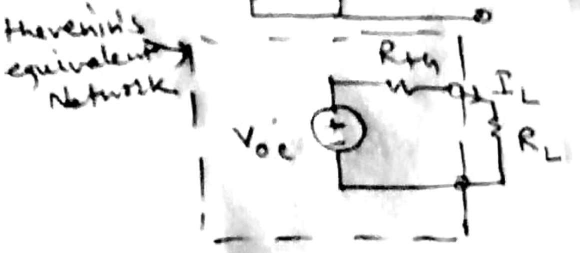
$V_{oc} = I r_3 = \frac{V_s}{r_1 + r_3} \cdot r_3$

Next to find internal resistance (thevenin's Resistance), the voltage source is removed



$R_{th} = r_2 + (r_1 \parallel r_3)$

$= r_2 + \frac{r_1 r_3}{r_1 + r_3}$



$I_L = \frac{V_{oc}}{R_{th} + R_L}$ Amp