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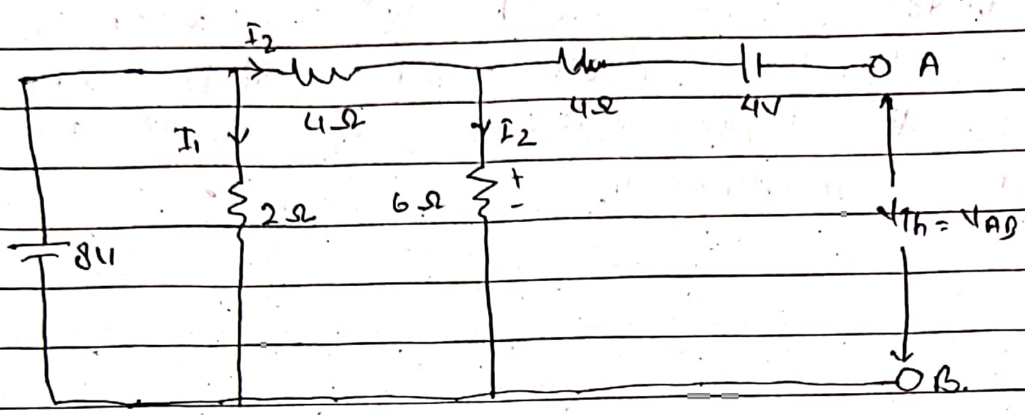
ACE 077 BCT020

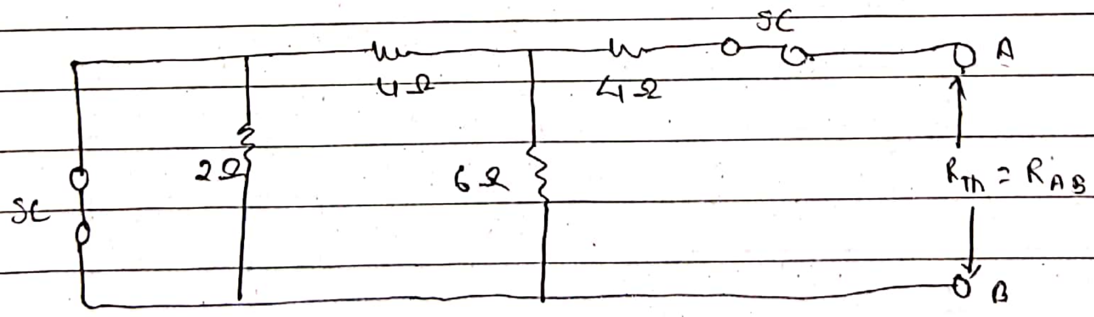
DC Portion

Q.N.2) Sol^n, In order to determine power tranfer,
to find V_{Th};



$$V_{Th} = V_{AB} = V_A - V_B$$
$$= 6I_2 - 4\times 0 - 4$$
$$= 6\times \frac{8}{4+6} - 4 \qquad \left[\because I_2 = \frac{8}{4+6} = \frac{8}{10}A\right]$$
$$= 0.8V.$$

To find R_{Th}.



$$R_{Th} = R_{AB}$$
$$= (4 \| 6) + 4$$
$$= \frac{4\times 6}{4+6} + 4$$
$$= 6.4\,\Omega$$

$\therefore$ As per the maximum power transfer theorem
$R_{Th} = R_L = 6.4\,\Omega$.

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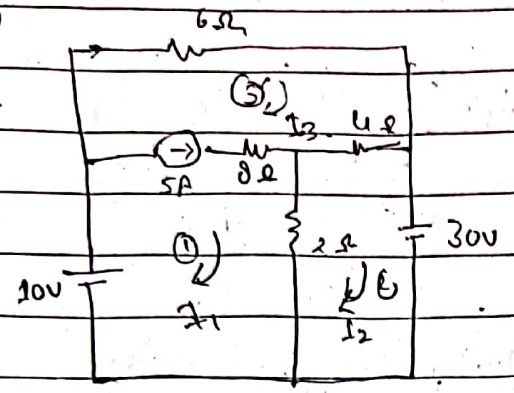
⇒

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 source resistance ".

Q.3



Sol^n,

Mesh I & mesh III we get, $I_1 - I_3 = 5A$ — (i)

Appling KVL on super meshe I & III, we get

$$10 - 6I_3 - 4(I_3 - I_2) - 2(I_1 - I_2) = 0$$

$$10 - 6I_3 - 4I_3 + 4I_2 - 2I_1 + 2I_2 = 0$$

$$-2I_1 + 6I_2 - 10I_3 = -10 \quad \text{— (ii)}$$

Appling KVL on mesh II we get.

$$-30 - 2(I_2 - I_1) - 4(I_2 - I_3) = 0$$

$$-30 - 2I_2 + 2I_1 - 4I_2 + 4I_3 = 0$$

$$2I_1 - 6I_2 + 4I_3 = 30 \quad \text{— (iii)}$$

Solve eq^n (i), (ii) & (iii) we get

$$I_1 = \frac{5}{3} A = 1.667 A$$

$$I_2 = -\frac{20}{3} A = -6.667 A$$

$$I_3 = -\frac{10}{3} A = -3.33 A$$

Now,

~~current in~~

current in branch containing $4\,\Omega$ resistor

$= 6.667 - 3.33$

$= 3.334$ A

current in branch containing $2\,\Omega$ resistor

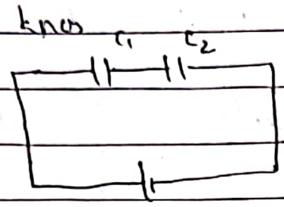
$= 1.667 + 6.667$

$= 8.334$ A.

Q.N.4)

Here at 1st when connected ~~to~~ series

we know

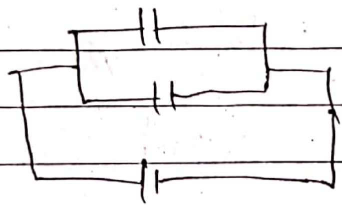


$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\frac{1}{0.025} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$40 = \frac{C_1 + C_2}{C_1 . C_2} \quad -(i)$$

Again In case of parallel



$$0.15 = C_1 + C_2$$

$$C_1 = (0.15 - C_2) \quad -(ii)$$

putting the value of C_1 in eq (i) we get

$$40 = \frac{(0.15 - C_2) + C_2}{(0.15 - C_2)\, C_2}$$

$$\text{or}\quad 40 = \frac{0.15 - \cancel{C_2} + \cancel{C_2}}{0.15\,C_2 - C_2^2}$$

$$\text{or}\quad 6C_2 - 40C_2^2 = 0.15$$

$$40C_2^2 - 6C_2 + 0.15 = 0$$

Solving above quadratic eq^n we get

$$C_2 = 0.031\ \mu f \quad \text{or},\ 0.1183\ \mu f$$

when,

$$C_2 = 0.031\ \mu f$$

$$C_1 = 0.15 - C_2$$

$$= 0.118\ \mu f$$

when

$$C_2 = 0.118\,\mu f$$

$$C_1 = 0.031\ \mu f.$$

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$\therefore$ The capacitance of each capacitor is $0.118\ \mu f$ & $0.031\ \mu f$