Name = Neeraj Singh
Course = B-TECH comp sci
Sub code = BEE 01T1003
adm. no = 21SCSE1011675
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(1) MMF = Magneto Motive force (force that tends to establish the flux through magnetic circuit.

Reluctance = Reluctance oppose the production of magnetic flux in magnetic circuit

$$\boxed{\text{Reluctance} = \frac{\text{mmf}}{\text{flux}}}$$

(2) $i = 50 \sin 314 t$

$i = i_0 \sin \omega t$

(b) maximum current $(i_0) = 50A$

(a)

$\omega = 2\pi\nu = \frac{2\pi}{T}$

$T = \frac{2\pi}{\omega} = \frac{2 \times 3.14}{314 \times 100} = 0.02$

Time period $\boxed{T = 0.02s}$

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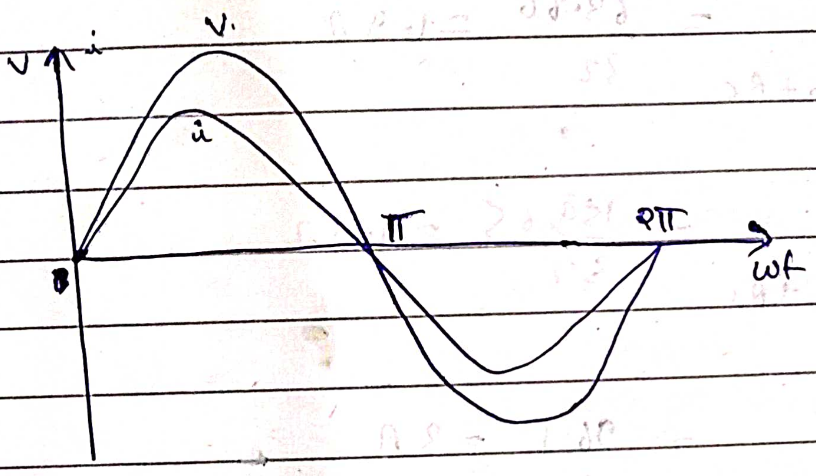
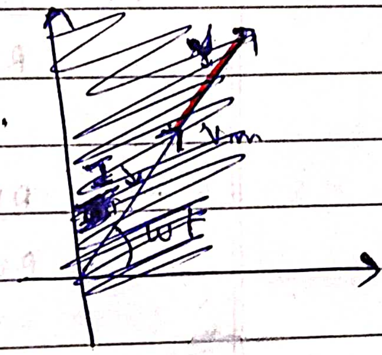
(3) Expression for instantaneous voltage

$$\boxed{v = v_m \sin \omega t}$$

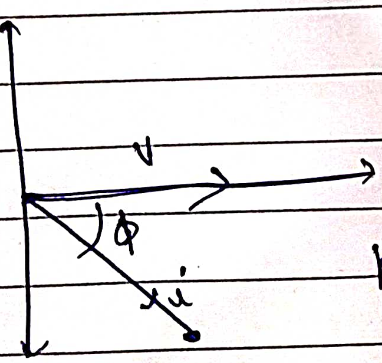
Expression for instantaneous current

$$\boxed{i = i_m \sin \omega t}$$





wave form



phasor diagram

(b)

Power, $P = vi$

$$P = (V_0 \sin \omega t)(i_0 \sin \omega t)$$

$$P = \frac{V_0 i_0 2 \sin^2 \omega t}{2} = \frac{V_0}{\sqrt{2}} \frac{i_0}{\sqrt{2}} (1 - \cos 2\omega t)$$

$$\boxed{P = \frac{V_0}{\sqrt{2}} \frac{i_0}{\sqrt{2}} - \frac{V_0}{\sqrt{2}} \frac{i_0}{\sqrt{2}} \cos 2\omega t}$$

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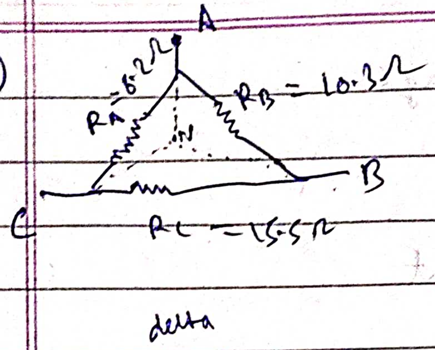
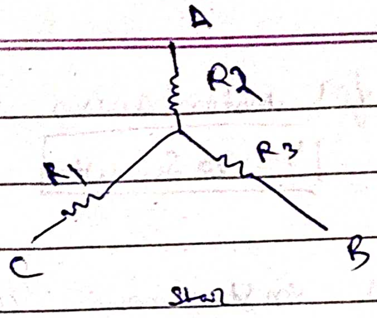
(4)





$$R_1 = \frac{R_a R_b}{R_a + R_b + R_c} = \frac{63.86}{32} = 1.9\Omega$$

$$R_2 = \frac{R_b R_c}{R_a + R_b + R_c} = \frac{159.65}{32} = 4.9\Omega$$

$$R_3 = \frac{R_a R_c}{R_a + R_b + R_c} = \frac{96.1}{32} = 3\Omega$$

(5) acc^n to Super position theorem, in any linear, bilateral multi source network, the current or voltage across any branch can be calculated by taking one source at a time and replacing the other active source by their internal resistance.

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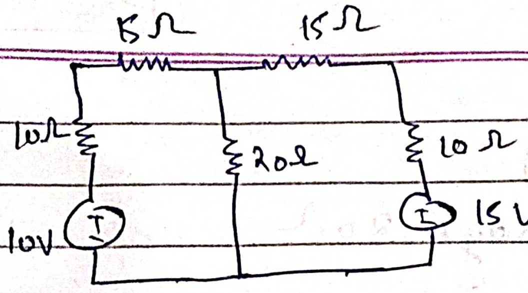
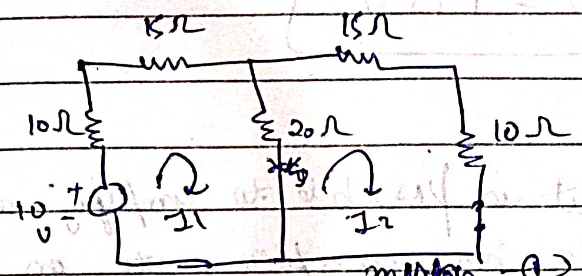


I across 20 Ω

There are 2 active sources.

Taking 10 V and replacing all other sources by their int. resis.



mesh - ①

① $-45I_1 + 20I_2 = -10$

$-9I_1 + 4I_2 = -2$

$\boxed{9I_1 - 4I_2 = 2}$ - ①

mesh - 2

$-45I_2 + 20I_1 = 0$

$45I_2 = 20I_1$

$\boxed{9I_2 = 4I_1}$ - ②

Solving ① and ②

$\boxed{I_1 = 0.18\text{ A}}$

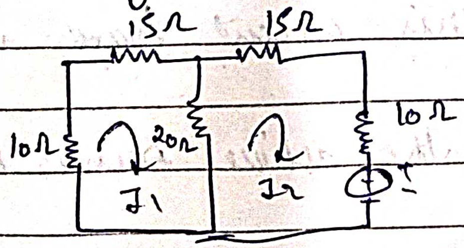
$\boxed{I_2 = 0.082\text{ A}}$

Current through 20 Ω

$I' = I_1 - I_2$

$\boxed{I' = 0.098\text{ A}}$ in direct of I_1

② Taking 15 V source and removing all other sources by their int R.



mesh - ①

$-45I_1 + 20I_2 = 0$ - ①

mesh - ②

$-45I_2 + 20I_1 = 10$ - ②

Solving ① and ②

$\boxed{I_2 = -1.38\text{ A}}$

$\boxed{I_1 = 0.61\text{ A}}$

current through 20 Ω $= I' = I_1 + I_2 = 0.61 - 1.38 =$

$\boxed{I' = -0.77\text{A}}$

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$I = I' + I'$

$I = 0.098 + (-0.77A)$

$\boxed{I = -0.672\,A}$ through 20Ω

Voltage across $20\Omega = V = iR$

$= V = 0.67 \times 20$

$\boxed{V = 1.19\,V}$

(6) Norton theorem states that it is possible to simplify any linear circuit, no matter how complex, to an equivalent circuit with just a single current source and parallel connected to a load. Just as with Thevenin's Theorem, the qualification of linear is identical to that found in the Superposition theorem: all underlying equation must be linear.

(8) steps

1. Identify load resistor R_L
2. Replace R_L with short circuit branch
3. The current flowing through this circuit branch will be the norton current I_N
4. Remove R_L and replace all the active sources by their internal resistance.
5. The equivalent resistance across the two open ends will be the norton resistance R_N
6. Draw norton's eq^n circuit
7. Calculate I_L using the identity

$$\boxed{I_L = \frac{I_N R_N}{R_N + R_L}}$$

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adm - 21SCSE1011675

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Comparison

- Norton theorem uses a current source, whereas Thevenin's theorem uses a voltage source
- Thevenin theorem uses a resistor in series, while Norton uses a resistor set in parallel with the source