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# BEEE Assignment 2

Q.1 MCQ.

(1) B. 3.67 Ω

(2) $R_C + R_B + \frac{R_C R_B}{R_A}$ (A)

(3) (A) 10 A.

(4) (B) Nodal Analysis

(5) (B) ~~opened~~ shorted.

(6) (B) 4.55 A

(7) (A) current lags voltage by 90°.

(8) 75 Ω (B)

(9) (A) 75 Hz, 100 V.

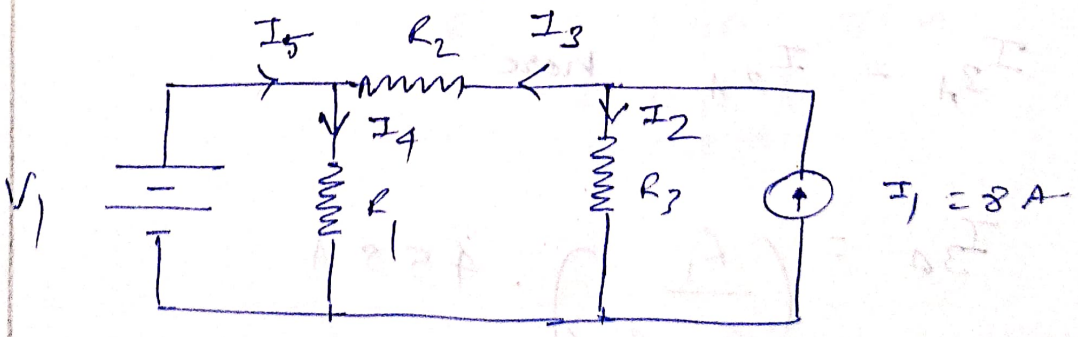
(10) (D) unity

Q.2.

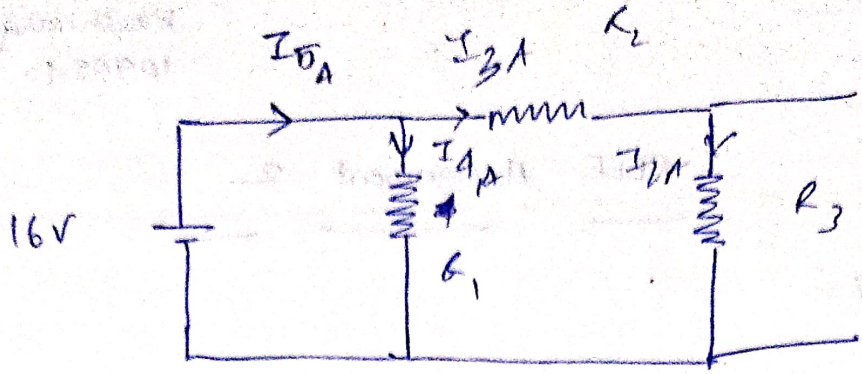
$V_1 = 9\ V$

$R_2 = 0 + 5 + 4 = 9\ \Omega$

$R_1 = 5\ \Omega$, $R_3 = 3\ \Omega$, $I_1 = 8\ A$.




Activating $V_1$, and deactivating others




$$R_{eq} = R_T + (R_2 + R_3) \,||\, R_1$$

$$R_{eq}^{-1} = \frac{R_1 + R_2 + R_3}{R_1 (R_2 + R_3)}$$

$$= \frac{5 + 9 + 3}{5 (9 + 3)}$$

$$R_{eq}^{-1} = \frac{17}{60}$$

$$R_{eq} = \frac{60}{17} = \underline{3.52\ \Omega}$$

$$I_{5A} = \frac{16}{3.52} = \underline{4.58\ A}$$

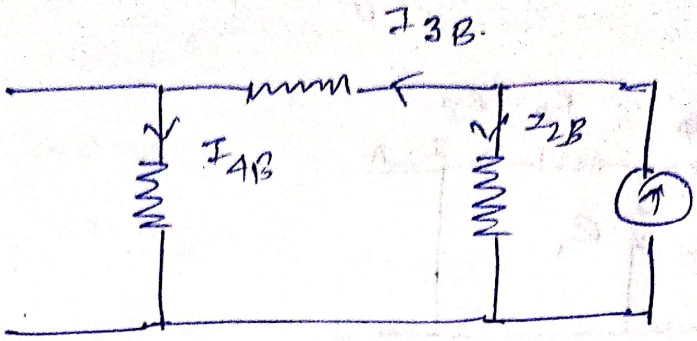
$I_{3A} = I_{2A}$ here

$$I_{3A} = \left(\frac{R_1}{R_1 + R_{3+4}}\right) \cdot 4.58\ A$$

$$= \frac{5}{12} \cdot (4.58) = \underline{1.90\ A}$$

$$I_{4A} = 4.58 - 1.90 = \underline{2.67\ A}$$

Deactivating $V_1$,

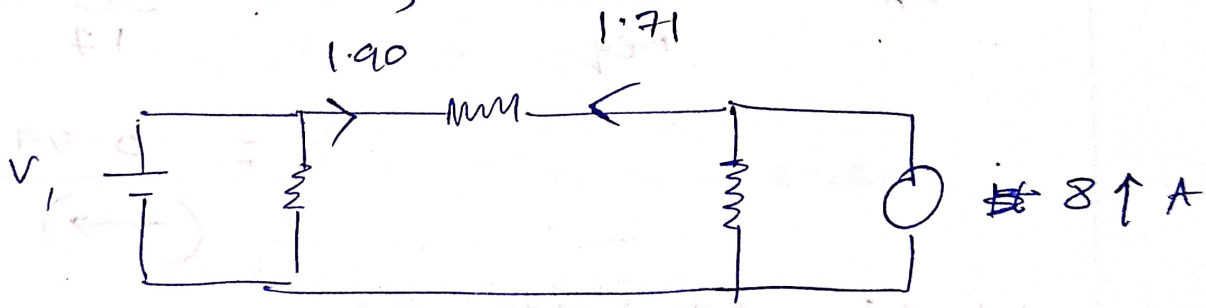



$$I_{3B} = \frac{R_3}{(R_2+R_1)} \cdot I_1 = I_{4B}$$

$$= 4\frac{(3)}{9+5} = 8(0.21) \cdot 4 = \underline{1.71\ A}$$

$$I_{2B} = 8 - 1.71 = \underline{6.29\ A}$$

∴ Net current,



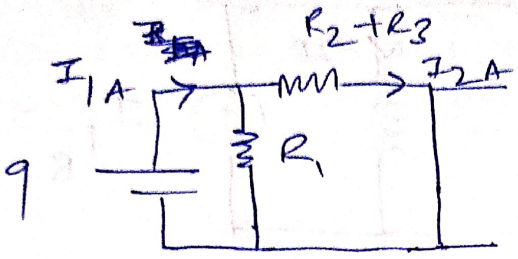

∴ Current through

$R_2 = 1.90 - 1.71\ A$

$= \underline{0.19\ A}$

By Superposition Principle,

Activating only $V_1 = 9V$,




Equivalent Resistance, $R_{eq}$

$$R_{eq} = \frac{(R_1)(R_2+R_3)}{R_1+R_2+R_3}$$

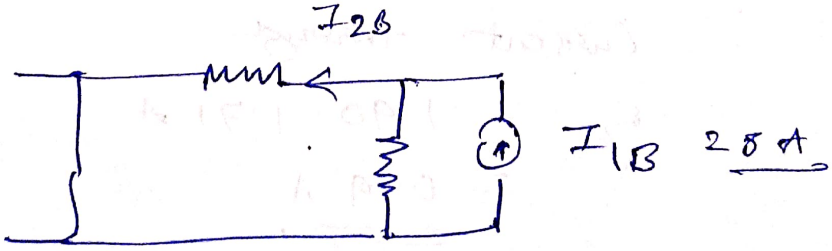
$$= \frac{60}{17} = 3.5\,\Omega$$

$$I_{1A} = \frac{V}{R} = \frac{9}{3.5} = 2.57\,A$$

$$I_{2A} = \frac{R_1}{R_{eq}} \cdot 2.57 = \frac{5}{17} \cdot (2.57)$$

$$= 0.77\,A \quad (\rightarrow)$$

Activating 8 A Supply,




$$I_{2B} = \frac{R_3}{R_{eq}} \cdot I_{1B} = \frac{3}{17} \cdot 8 = 1.4\,A \quad (\leftarrow)$$

$\therefore$ Net $I$ = $1.4 - 0.77\,A = 0.63\,A$ $(\leftarrow)$

through $R_2 = 9\,\Omega$

Q 3. $R = 54\ \Omega$

$L = 9\ mH$

$C = 150\ \mu F$

$V = 150\ V$

$f = 50\ Hz$

$\omega = 2\pi f = 3.14 \times 2 (f) = 314\ rad/s$

$X_L = \omega L$

$= (314)(9)(10^{-3})$

$= 2.826\ \Omega$

$X_C = \frac{1}{\omega C} = \frac{1}{(314)(150) \times (10^{-6})}$

$= 21.23\ \Omega$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$= \sqrt{54^2 + (21.23 - 2.826)^2}$

$= \sqrt{2916 + 338.7}$

$= 57.05\ \Omega$

(b) Current $= \frac{150}{57.05} = 2.629\ A$

(a) Impedence $= 57.05\ \Omega$

(c) V through $R = I \cdot R = 2.629 \times 54\ \Omega$

$= 141.9\ V$

V through $L = I \cdot X_L = 2.629 \times 2.826 = 7.42\ V$

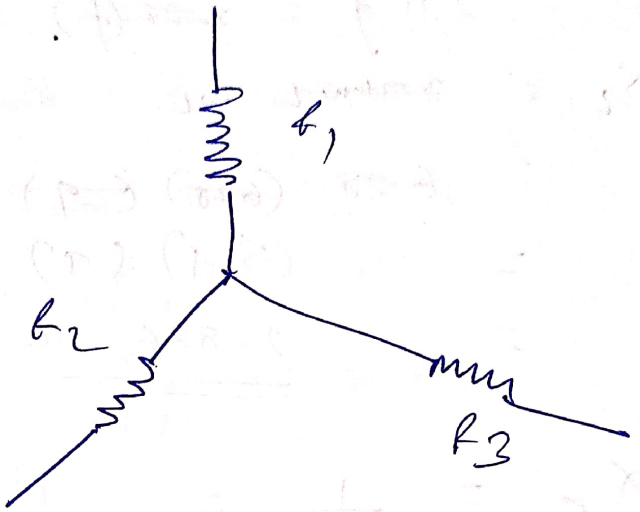
V through $C = I \cdot X_C = 2.629 \times 21.23 = 55.81\ V$

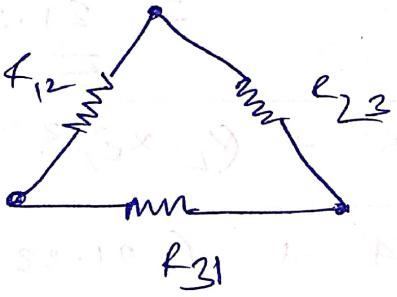
Q④. Star → Delta

$R_1 = 25\ \Omega$

$R_2 = 54\ \Omega$

$R_3 = 9\ \Omega$




For Delta,

$R_{12} = R_1 + R_2 + \frac{R_1 \times R_2}{R_3}$

$= 25 + 54 + \frac{25 \times 54}{9}$

$= \underline{229\ \Omega}$

$R_{23} = R_2 + R_3 + \frac{R_2 \cdot R_3}{R_1}$

$= 54 + 9 + \frac{54 \cdot 9}{25}$

$= \underline{\underline{62.44\ \Omega}}$

$$R_{31} = R_3 + R_1 + \frac{R_2 \cdot R_1}{R_2}$$

$$= 9 + 25 + \frac{(9 \cdot 25)}{54}$$

$$= 38.1\ \Omega$$