ASSIGNMENT 02 [Final-TERM]

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Problem-01

Fig-1 (a)

(i) Here,

$$e(t) = 282.84 \sin 100t \; V$$

$$R = 6\,\Omega$$

$$L = 80\,mH = 0.01H$$

$$X_L = \omega L = (100 \times 0.08) = 8\,\Omega$$

Impedance, $\vec{Z} = R + jX_L$

$$= 6\,\Omega + j8$$

$$= 10\,\Omega \angle 53.13^\circ$$

(ii)

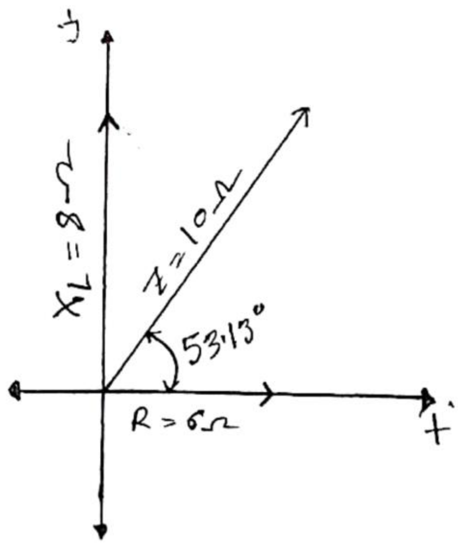


Fig-1(b)

(i) Here,

$$e(t) = 282.84 \sin 100t \ \text{V}$$

$$R = 8.66\,\Omega$$

$$C = 2\text{mF} = 0.002\,\text{F}$$

$$X_c = \frac{1}{\omega C} = \frac{1}{100 \times 0.002} = 5\,\Omega$$

$$\text{Impedonce } \vec{Z} = R - jX_C$$

$$= 8.66\,\Omega - j5$$

$$= 10\,\Omega \angle -30^\circ$$

(ii)

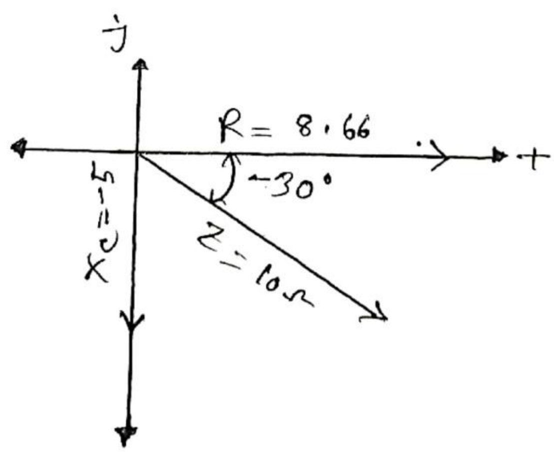


Fig – 1 (c)

(i) Here,

$E = 80V\angle 0^\circ$

$R = 10\,\Omega$

$X_L = 20\,\Omega, X_C = 30\,\Omega$

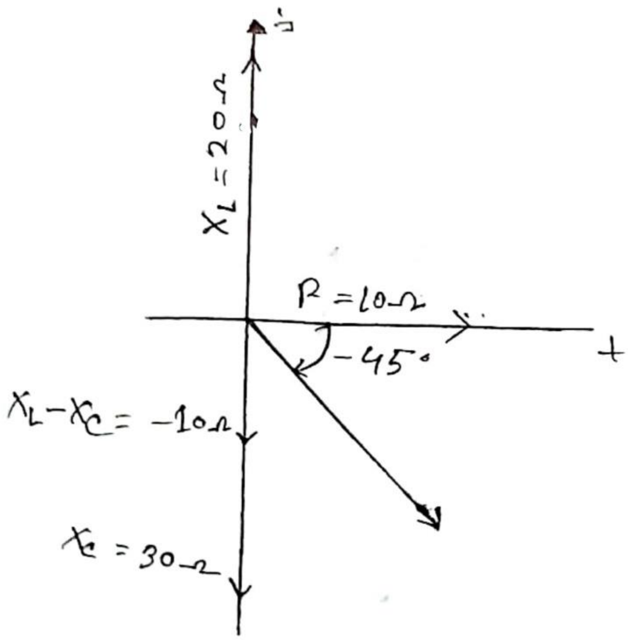
Impedance, $\vec{Z} = R + jX_L - jX_C$

$= 10\,\Omega + j20\,\Omega - j30\,\Omega$

$= 10\,\Omega - j10$

$= 14.14\angle -45^\circ$

(ii)



Problem - 2

Fig - 2(a)

(i) Here

$R = 10\,\Omega$, $X_L = 16\,\Omega$

$G_L = \frac{1}{10} = 0.1S.$

$B_L = \frac{1}{16} = 0.063S$

Admittence, $\vec{Y} = G_L - jB_L$

$= 0.1S - j0.063$

$= 0.12 \angle -32.21°$

(ii)

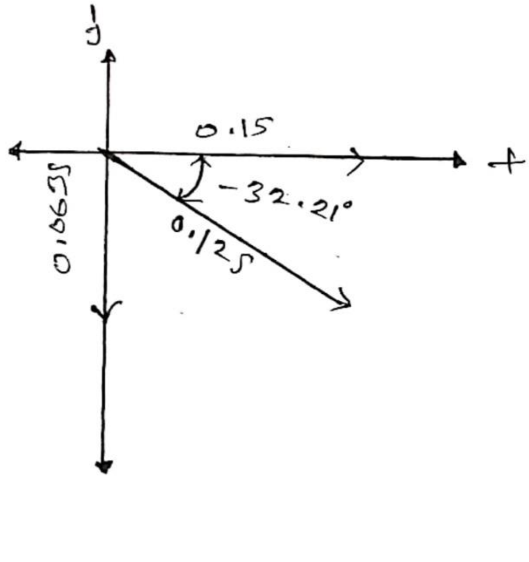


Fig-2(b)

(i) Herce,

$$R = 10\Omega$$

$$G = \frac{1}{10} = 0.1S$$

$$X_C = 32\Omega$$

$$B_C = \frac{1}{32} = 0.031S$$

Admitonce, $\vec{Y} = G + jB_C$

$$= 0.1 + j0.031S$$

$$= 0.1\angle 17.22^\circ$$

(ii)

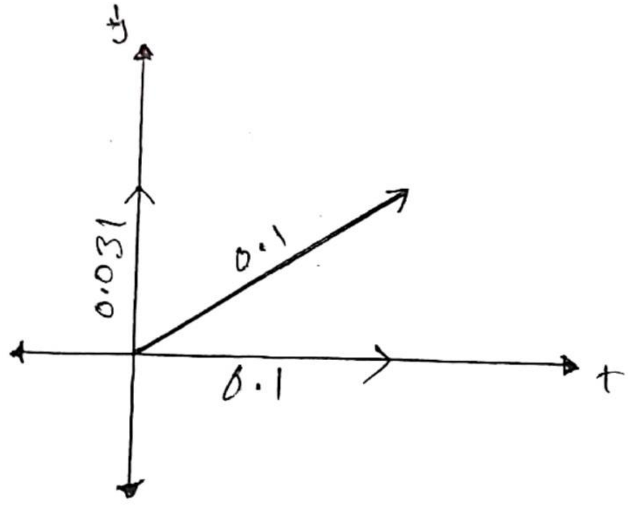


Fig – 2(c)

(i) Here,

$R = 10\,\Omega$, $G = \frac{1}{10} = 0.1\,S$

$X_L = 16\,\Omega$, $B_L = \frac{1}{16} = 0.063\,S$

$X_C = 32\,\Omega$, $B_C = \frac{1}{32} = 0.031\,S$

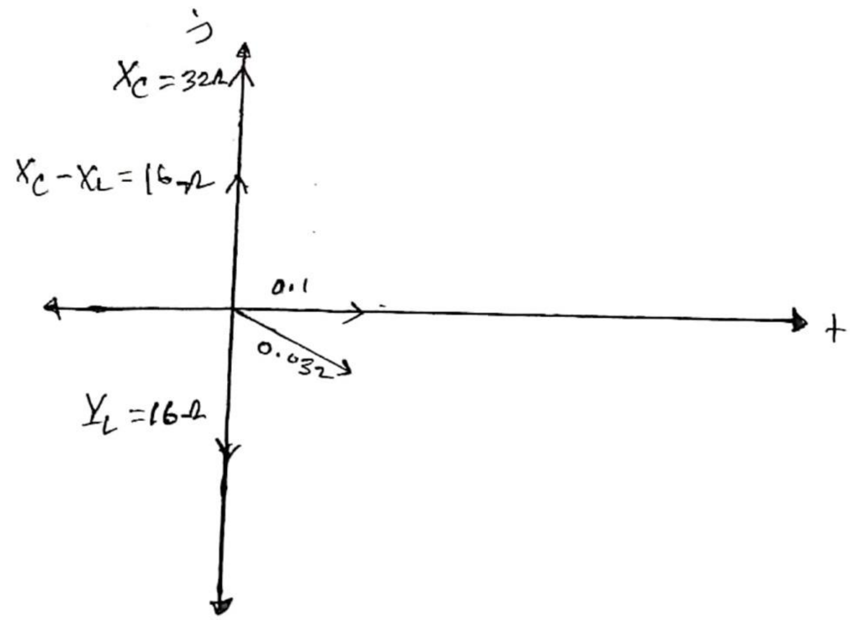
Admittance, $\vec{Y} = G - jB_L + jB_C$

$= 0.1S - j(0.063 - 0.031)S$

$= 0.1S - j0.032$

$= 0.1S \angle -17.74°$

(ii)



Problem-3

Fig-1(a)

(i) Here,

$\vec{Z} = 10\Omega \angle 53.13°$

$e(t) = 282.84 \sin 100 t$ V

$\vec{E} = (0.707 \times 282.84) \angle 0°$

$= 200 \angle 0°$

$R = 6\Omega$, $X_L = 8\Omega$

$\therefore \vec{I} = \dfrac{\vec{E}}{\vec{Z}} = \dfrac{200\angle 0°}{10\angle 53.13°}$

$= 20 \angle -53.13°$

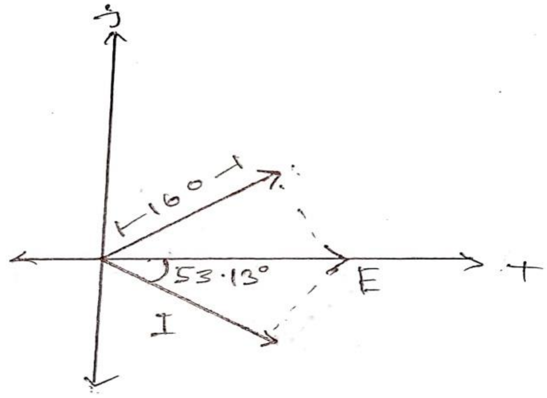
$\therefore V_R = \vec{I}\,\vec{Z}_R = (20\angle -53.13°) \times (6\angle 0°)$

$= 120 \angle -53.13°$

$\therefore V_L = \vec{I}\,\vec{Z}_L = (20\angle -53.13°) \times (8\angle 90°)$

$= 160 \angle 36.87°$

(ii)



Problem-4

Fig-2(b)

(i) Here,

$R = 10\Omega$

$X_C = 32\Omega$

$\vec{Y} = 0.1\,S\angle 16.7^\circ$

$\vec{E} = 150V\angle 0^\circ$

$\therefore I = \vec{E}\cdot\vec{Y} = (150V\angle 0^\circ)\times(0.1\angle 16.7^\circ)$

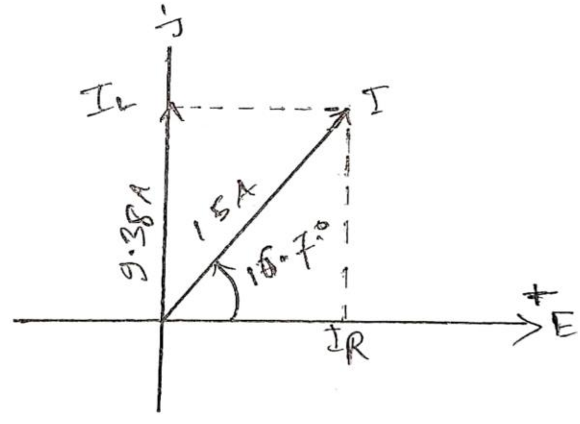
$= 15\angle 16.7^\circ$

$\therefore I_R = \dfrac{\vec{E}}{R\angle 0^\circ} = \dfrac{150V}{10\Omega\angle 0^\circ} = 15\angle 0^\circ$

$\therefore I_L = \dfrac{\vec{E}}{X_c\angle 90^\circ} = \dfrac{150V.}{32\Omega\angle 90^\circ}$

$= 9.38\angle -90^\circ$

(ii)



Problem - 5

(i) $Z_T = \dfrac{1}{\frac{1}{10} + \frac{1}{j16} + \frac{1}{-j32}}$

$= \dfrac{1}{\frac{1}{10} + \frac{1}{j16} - \frac{1}{j32}}$

$= 9.54 \angle -17.35°$

$\therefore \theta_Z = -17.35°$

Power factor,

$pf = \cos\theta_z$

$= \cos(-17.35°) = 0.954$ lagging

Reactive factor,

$rf = \sin\theta_Z$

$= \sin(-17.35)$

$= 0.299$

Power consumes by resistor, $= \frac{E^2}{R}$

$= \frac{(150)^2}{10}$

$= 2250W$

Reactive power consumed by the inductor,

$= \frac{E^2}{X_L} = \frac{(150)^2}{16}$

$= 1406.25$ var

Reactive power supply by capacitor

$\frac{E^2}{X_C} = \frac{(150)^2}{32}$

$= 703.125$ var

The net reactive power, Q

$Q_L + Q_C$

$= \frac{E^2}{X_L} + \frac{E^2}{X_C}$

$= (1402.25) + (703.125)$

$= 2109.375$ var

The apparent power,

$$S = \sqrt{(P)^2 + (Q)^2}$$

$$= \sqrt{(2250)^2 + (2109.375}$$

$$= 3084.14 \text{ VA}$$

(ii)