ASSIGNMENT 01 [Final-TERM]

American International University- Bangladesh (AIUB)

Submitted by:
Name: Nokibul Arfin Siam.
Student ID: 21-44793-1.
Section: K.

Problem-1 :-

$$V(t) = 100\sin(314t + 70^\circ)\,V$$
$$i(t) = 20\sin(314t + 100^\circ)\,A$$

a.

(i) From equation $V(t)$ & $i(t)$,

$V_m = 100\,V$

$I_m = 20A.$

$\therefore$ impedence, $Z = \frac{V_m}{I_m} = \frac{100V}{20A} = 5\Omega$

(ii) Admittance,

$$Y = \frac{1}{Z} = \frac{1}{5}$$
$$= 0.2\,S$$
$$= 200\,mS$$

b.

(i) From equation,

$$\theta_v = 70^\circ$$

$$\theta_i = 100^\circ$$

$$\therefore \theta_z = \theta_v - \theta_i = (70^\circ - 100^\circ) = -30^\circ$$

$\therefore$ The resistance,

$$R = Z\cos\theta_z = 5\cos(-30^\circ)$$

$$= 4.33\ \Omega$$

(ii) The reactance,

$$X = Z\sin\theta_z = 5\sin(-30)$$

$$= -2.5\ \Omega$$

(iii) We know,

$$Y = 200\ mS$$

From equation,

$$\theta_v = 70^\circ$$

$$\theta_i = 100^\circ$$

$$\therefore \theta_y = \theta_i - \theta_v = (100^\circ - 70^\circ) = 30^\circ$$

$\therefore$ The conductance,

$$G = Y\cos\theta_y = 200\cos(30)^\circ$$

$$= 173.20\ mS$$

(iv) The susceptance,

$$B = Y \sin\theta_y = 200 \sin(30^\circ)$$
$$= 100 \text{ ms}$$

c.

(i) Here,

$$\theta_v = 70^\circ$$
$$\theta_i = 100^\circ$$
$$\therefore \theta = \theta_v - \theta_i = (70^\circ - 100^\circ) = -30^\circ$$

$\therefore$ Power factor, $pf = \cos\theta = \cos(-30)$
$= 0.87$

(ii) The reactive factor,

$$rf = \sin\theta = \sin(-30)$$
$$= -0.5$$

(iii) Here,

$$V_m = 100\text{V}$$
$$I_m = 20\text{A}$$
$$\theta = -30^\circ$$

The power, $P = \frac{V_m I_m}{2} \cos\theta$

$$= \frac{100 \times 20}{2} \cos(-30)$$
$$= 866.03 \text{ W}$$

(iv) The reactive power,

$$Q = \frac{V_m I_m}{2} \sin\theta$$
$$= \frac{100 \times 20}{2} \sin(-30^\circ)$$
$$= -500 \text{ var}$$

(v) The apparent power,

$$S = \frac{V_m I_m}{2}$$

$$= \frac{100 \times 20}{2}$$

$$= 1000\ VA$$

d. Voltage and current in polar from.

$$\therefore V = (0.707 \times 100) \angle 70^\circ = 70.7 \angle 70^\circ\ V$$

$$\therefore I = (0.707 \times 20) \angle 100^\circ = 14.14 \angle 100^\circ\ A$$

e. $S = VI$

$$= (70.7 \angle 70^\circ)(14.14 \angle 100^\circ)$$

$$= (70.7 \angle 70^\circ)(14.14 \angle -100^\circ)$$

$$= 999.83 \angle -30$$

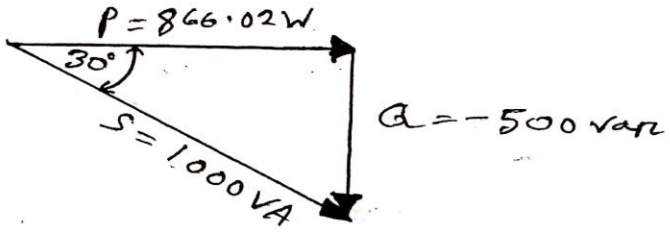
$$= 865.88 + 499.915\ j$$

f. We find;

$$P = 866.02\ W$$

$$Q = -500\ var$$

$$S = 1000\ VA$$



Problem - 2

a. $v(t) = 50 \sin(377t + 30^\circ) V$

(i)

$R = 20.0 \text{ ohm}.$

$\therefore Z = 20.$

$\theta_z = 0^\circ.$

$\therefore I_m = \frac{V_m}{Z} = \frac{50}{20} = 2.5 A.$

$\because \theta_i = \theta_v - \theta_z.$

$\Rightarrow \theta_i = 30 - 0^\circ$

$\therefore \theta_i = 30^\circ$

$\therefore i(t) = 2.5 \sin(377t + 30^\circ) A$

(ii) $L = 50 \text{ mH} = 0.05 H$

$Z = X_L = \omega L = 377 \times 0.05 = 18.85$

$\theta_z = 90^\circ$

$\therefore I_m = \frac{V_m}{Z} = \frac{50}{18.85} = 2.65 A$

$\theta_i = \theta_v - \theta_z$

$= 30^\circ - 90^\circ$

$= -60^\circ$

$\therefore i(t) = 2.65 \sin(377t - 60^\circ) A$

(iii)

$C = 200\ \mu F = 0.0002\ F$

$Z = X_C = \frac{1}{\omega C}$

$= \frac{1}{377 \times 0.0002}$

$= 13.26$

$\theta_z = -90°$

$\therefore I_m = \frac{V_m}{Z} = \frac{50}{13.26} = 3.77\ A$

$\theta_i = \theta_v - \theta_z$

$= 30° - (-90°)$

$= 120°$

$\therefore i(t) = 3.77 \sin(377t + 120°)\ A$

b) $i(t) = 5 \sin(200t + 50°)\ A$

(i)

$R = 10$ ohm.

$\therefore Z = 10\ \Omega.$

$\theta_z = 0°$

$\therefore V_m = Z I_m = 10 \times 5 = 50\ V$

$\theta_v = \theta_i + \theta_z$

$= 50° + 0°$

$= 50°$

$\therefore V(t) = 50 \sin(200t + 50°)\ V$

(ii) $X_L = Z = 20\ \Omega$.

$\theta_Z = 90°$.

$\therefore V_m = I_m Z = 5 \times 20 = 100\ V$

$\therefore \theta_V = \theta_i + \theta_Z$

$= 50° + 90°$

$= 140°$

$\therefore v(t) = 100 \sin(200t + 140°)\ V$

(iii) $X_C = Z = 15\ \Omega$.

$\theta_Z = -90°$

$\therefore V_m = Z I_m = 15 \times 5 = 75\ V$

$\therefore \theta_V = \theta_i + \theta_Z = 50° + (-90°) = -40°$

$\therefore v(t) = .75 \sin(200t - 40°)\ V$

THE END