Assignment 1

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Home Work

Problem 1: The current $i(t)= 4\sin(\omega t\text{-}20°)$ A flows through a 8 Ω resistor. (***i***) What is the sinusoidal expression for the voltage? (***ii***) Calculate the real power, reactive power, power factor, reactive factor. (***iii***) write the expression of instantaneous power. (***iv***) Sketch the *v* and *i* sinusoidal waveforms on the same axis. (***v***) Draw the phasor diagram.

Problem 2: The voltage $v(t)= 20\sin(\omega t+30°)$ V is applied to a 4 Ω resistor. (***i***) What is the sinusoidal expression for the current? (**ii**) Calculate the real power, reactive power, power factor, reactive factor. (**iii**) write the expression of instantaneous power. (**iv**) Sketch the *v* and *i* sinusoidal waveforms on the same axis. (**v**) Draw the phasor diagram.

Problem 1:

(i)-

Problem:1 here, $i(t) = 4\sin(\omega t - 20^\circ)$; 8Ω resistor

(i) $V = IZ_R$

$= \left(\frac{4}{\sqrt{2}} \angle -20\right) \times (8 \angle 0^\circ)$

$= 22.62 \angle -20^\circ$

$V(t) = \sqrt{2}\, V \sin(\omega t - 20^\circ)$

$= 32 \sin(\omega t - 20^\circ)$ [Ans]

(ii)-

(ii) Angle of impedance, $\theta = \theta_Z = \theta_V - \theta_i$

$= -20^\circ + 20^\circ = 0^\circ$

So,

power factor, $pf = \cos 0^\circ = 1$

reactive factor, $rf = \sin 0^\circ = 0$

Real power, $P = VI\cos\theta_Z = 22.62 \times 2.82 \times 1 = 63.78$ watt

Reactive power, $Q = VI\sin\theta_Z$

$= 0$ var

(iii)-

(iii) instantaneous power=

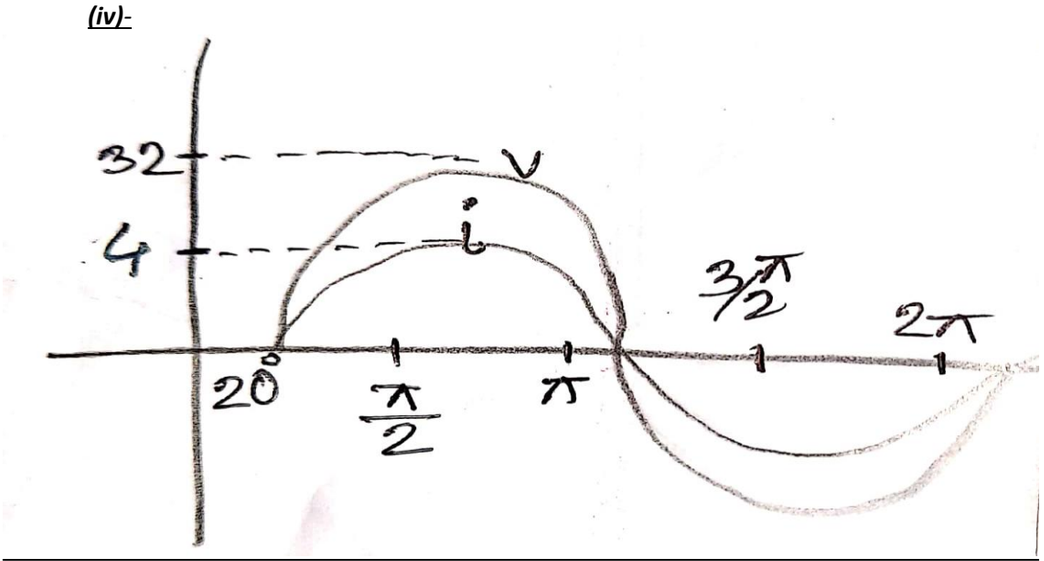
$$p(t) = VI\cos\theta_z - VI\cos(2\omega t + \theta_z)$$

~~eq 1~~

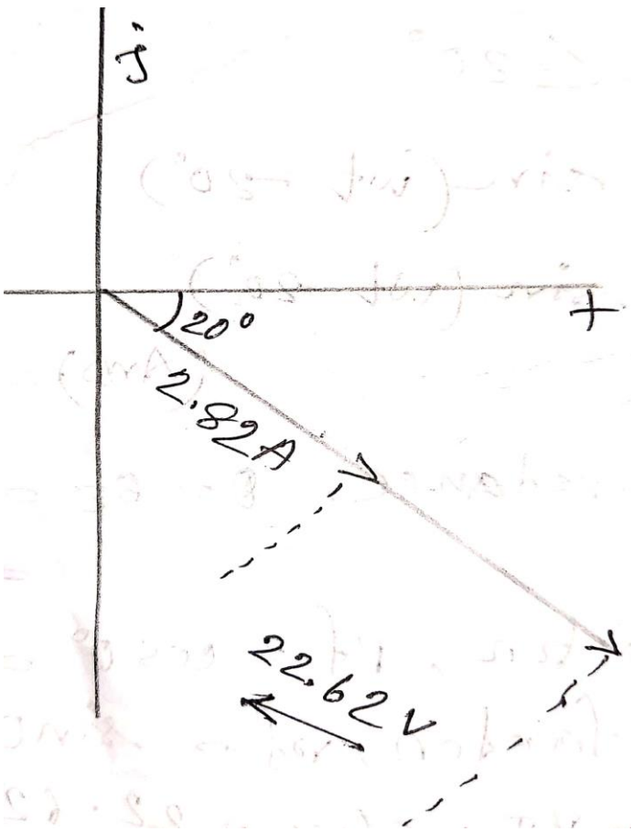
$$= 63.78 - 63.78\cos 2\omega t$$

$$= 63.78(1 - \cos 2\omega t)$$

(iv)-



(v)-



Problem 2:

(i)-

problem:2

(i) $v(t) = 20 \sin(\omega t + 30^\circ)$; 4Ω resistor

$$I = \frac{V}{Z} = \frac{\frac{20}{\sqrt{2}} \angle 30^\circ}{4 \angle 0^\circ}$$

$$= 3.53 \angle 30^\circ \text{ A}$$

$$i(t) = \sqrt{2} I \sin(\omega t + 30^\circ)$$

$$= 5 \sin(\omega t + 30^\circ)$$

(ii)-

Real power, $P = VI \cos\theta$

$$= \frac{20}{\sqrt{2}} \times 3.53 \times \cos 0^\circ$$

$$= 49.92 \text{ watt}$$

Reactive power, $Q = VI \sin\theta$

$$= 0 \text{ var}$$

power factor, $pf = \cos 0^\circ = 1$

reactive factor, $rf = \sin 0^\circ = 0$

(iii)-

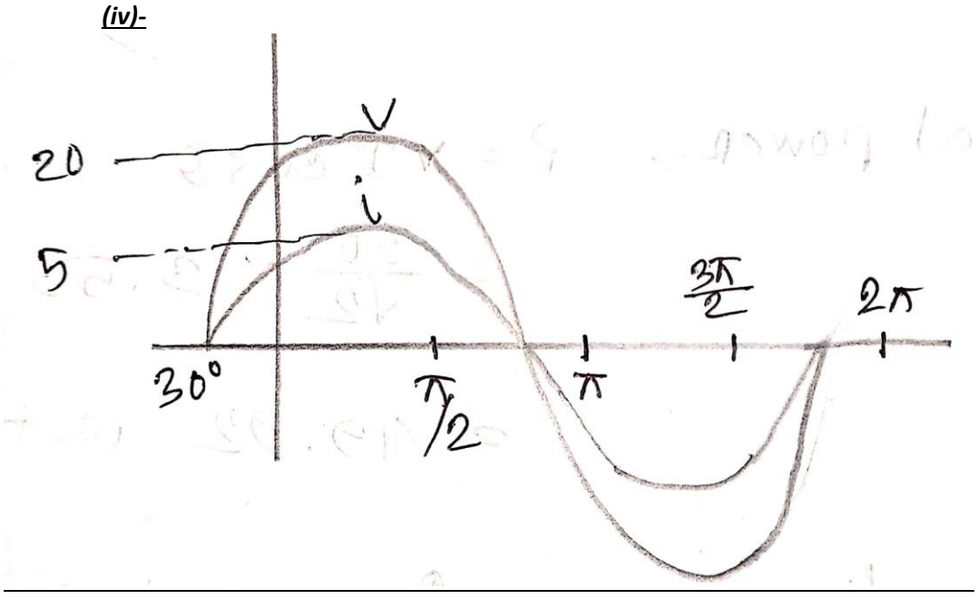
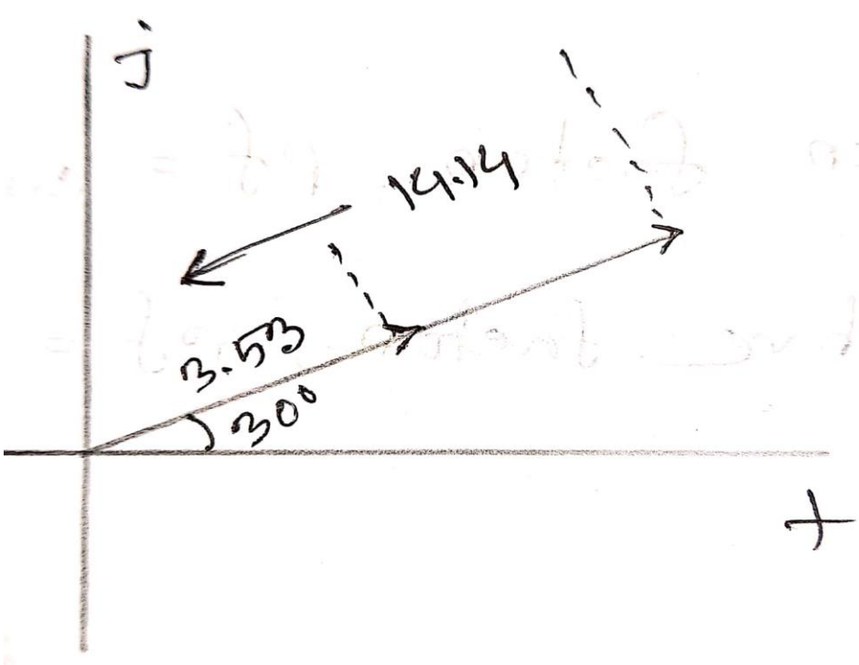
instantaneous power,

$$P(t) = VI\cos\theta - VI\cos(2\omega t + \theta)$$

$$= 49.92 - 49.92 \cos 2\omega t$$

$$= 49.92(1 - \cos 2\omega t)$$

(iv)-



(v)-