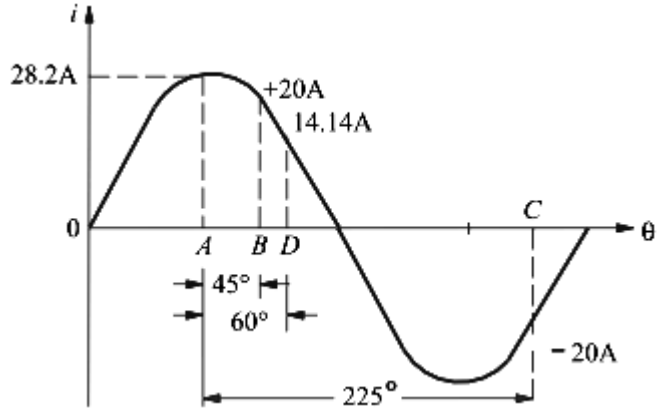
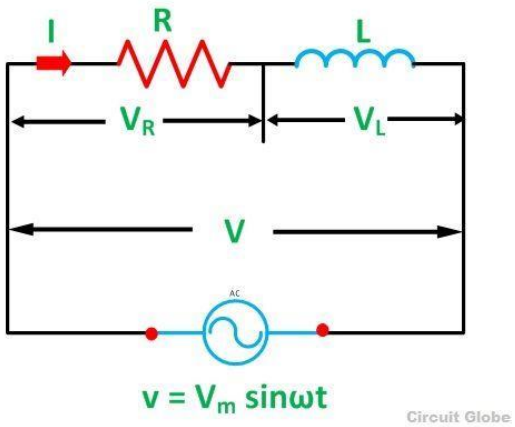
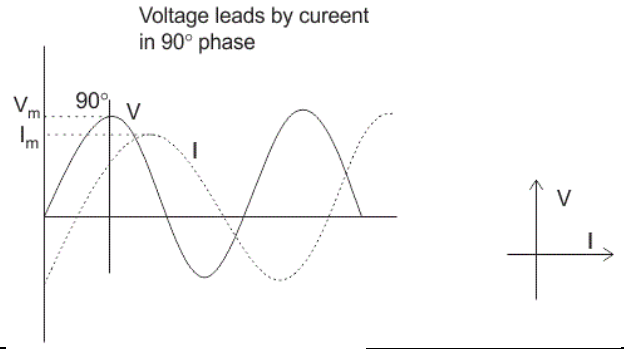
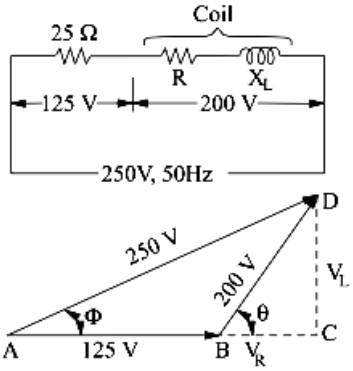
SCHEME AND SOLUTION

CIE-2

BASICS OF ELECTICAL ENGINEERING(EE123ATD)

Q.NO	SOLUTION	Marks
1.a	$I_{RMS} = 0.707\ I_M$, $I_{AV}=0.637I_M$ ----------04M	**04**
b	 ----------**06M** Im = 20√2 = 28.2 A, ω = 2π × 50 = 100 π rad/s. i = 28.2 sin 100 πt ampere (i) When t = 0.0025 second i = 28.2 cos 100π × 0.0025 ...angle in radian = 28.2 cos 100 × 180 × 0.0025 ...angle in degrees = 28.2 cos 45º = 20 A ...point (ii) (ii) When t = 0.0125 second i = 28.2 cos 100 × 180 × 0.0125 = 28.2 cos 225º = 28.2 × (1/ √2) − = −20 A ...point **(iii)** (iii) Here i = 14.14 A ∴ 14.14 = 28.2 cos 100 × 180 t ∴ cos 100 × 180 t = 1/2 or 100 × 180 t = cos−1 (0.5) = 60º, t = 1/300 second ...point D	**06**
2.a	 $V_R = IR$ and $V_L = I_{XL}$ where $X_L = 2\pi fL$ $V = \sqrt{(V_R)^2 + (V_L)^2} = \sqrt{(IR)^2 + (IX_L)^2}$ $V = I\sqrt{R^2 + X_L^2}$ or $I = L = \frac{V}{Z}$	**05**

	Where, $Z = \sqrt{R^2 + X_L^2}$ $P = \text{average of } \frac{V_m}{\sqrt{2}}\frac{V_m}{\sqrt{2}}\cos\varphi - \text{average of } \frac{V_m}{\sqrt{2}}\frac{V_m}{\sqrt{2}}\cos(2\omega t - \varphi)$ or $P = \frac{V_m}{\sqrt{2}}\frac{I_m}{\sqrt{2}}\cos\varphi - \text{Zero}$ or $P = V_{r.m.s} I_{r.m.s} \cos\varphi = V I \cos\varphi$  	
b.	 $BC^2 + CD^2 = 200^2$ ...(i) $(125 + BC)2 + CD2 = 250^2$ ...(ii) Subtracting Eq. (i) from (ii), we get, $(125 + BC)2 - BC2 = 250^2 - 200^2$ ∴ BC = 27.5V; CD = √(2002 - 27.52) = 198.1V (i) Coil impedance = 200/5 = 40 Ω $V_R = IR = BC$ or 5 R = 27.5 ∴ P = 27.5/5 = 5.5 Ω Also $V_L = I \cdot X_L = CD = 198.1$ ∴ X_L = 198.1/5 = 39.62 Ω or X_L = (402 - 5.52) = 39.62Ω (ii) Power absorbed by the coil is = $I^2R = 52 \times 5.5 = 137.5$ W Also P = 200 × 5 × 27.5/200 = 137.5 W (iii) Total power = VI cos φ = 250 × 5 × AC/AD = 250 × 5 × 152.5/250 = 762.5 W	**05**
3.a	I_L = 73.64A, I_{PH} = 42.53A, W_1 = - 2.65 KW, W_2 = 24.08 KW	**06**
b	Any 4 advantages	**04**
4.a	Star : $E_L = \sqrt{3}\, E_{ph}$, $I_L = I_{ph}$, Delta: $I_L = \sqrt{3}\, I_{ph}$, $E_L = E_{ph}$	**05**
b	Z_{ph} = 9.23 ohm, R = 7.384 ohm, X_L= 5.538 ohm, L= 0.0176H Q = 10392.30, S = 17320.5	**05**
5.a	i) Unity pf = $W_1 = W_2$ ii) 0.5 pf = W_1= 0, W_2=0.866 iii) zero pf = W_1=-0.5, W_2= +0.5	**06**
b	P = 4.5 KW, Pf = 0.866	**04**