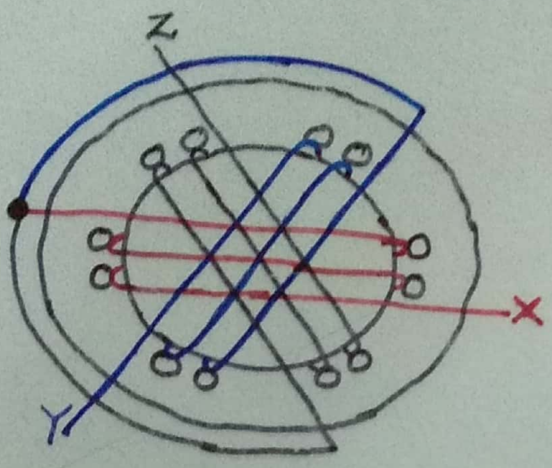
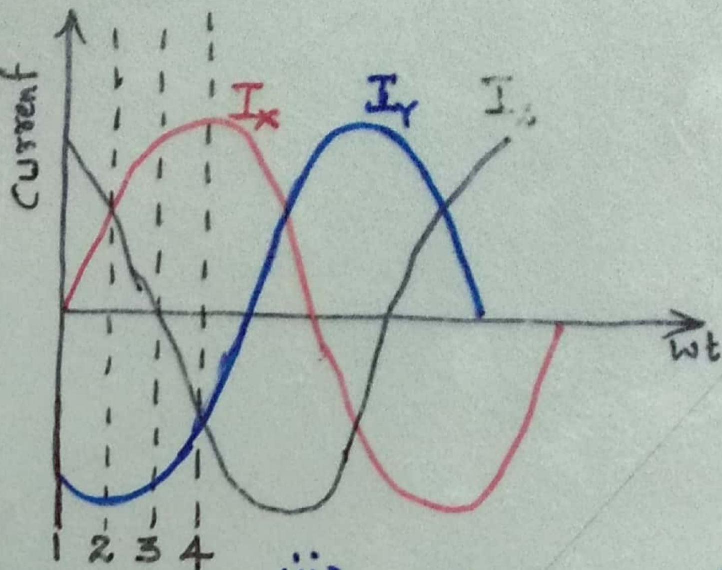
Rotating Magnetic field Theory



(i)

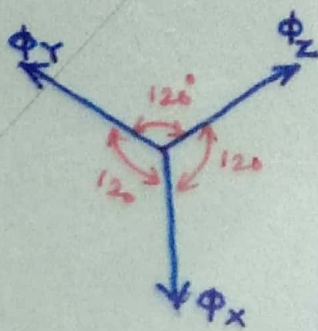


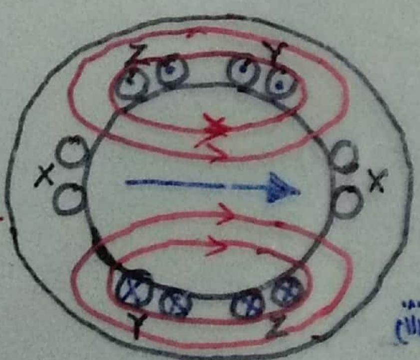
(ii)

$\phi_X = \phi_m \sin \omega t$

$\phi_Y = \phi_m \sin(\omega t - 120°)$

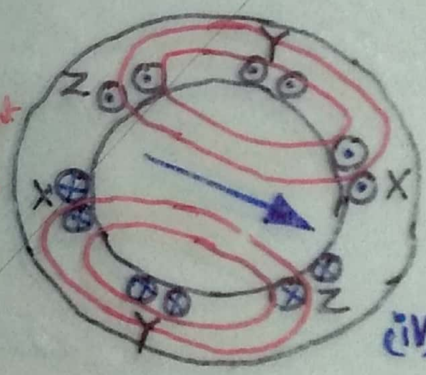
$\phi_Z = \phi_m \sin(\omega t - 240°)$





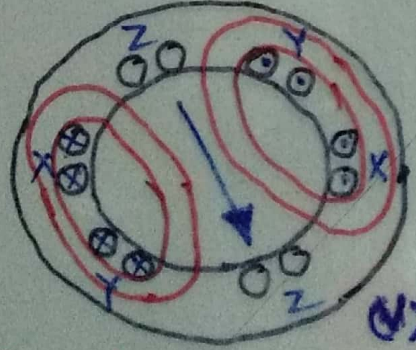
At Instant 1 $\omega t = 0°$

(iii)



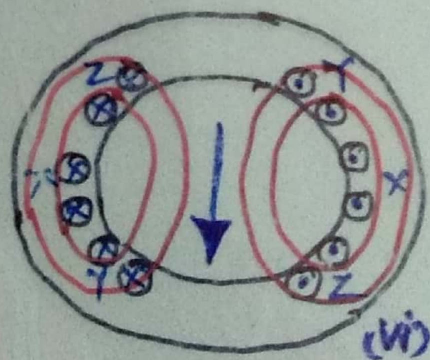
At Instant 2 $\omega t = 30°$

(iv)



(v)

At Instant 3 $\omega t = 60°$



(vi)

At Instant 4 $\omega t = 90°$

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At instant 1, $\omega t = 0^\circ$

$\therefore \ \phi_x = \phi_m \sin(0^\circ)$

$\phi_Y = \phi_m \sin(0 - 120^\circ)$

$\phi_Z = \phi_m \sin(0 - 240^\circ)$

$\Rightarrow \ \phi_x = 0$

$\phi_Y = \phi_m \sin(-120) = -\frac{\sqrt{3}}{2}\phi_m$

$\phi_Z = \phi_m \sin(-240) = \frac{\sqrt{3}}{2}\phi_m$

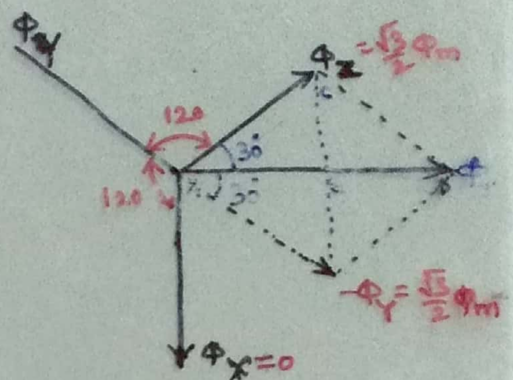


fig ②

In fig ② from Δ^{le} ABC

$$\cos 30 = \frac{AB}{\frac{\sqrt{3}}{2}\phi_m}$$

$$\frac{\sqrt{3}}{2} = \frac{AB}{\frac{\sqrt{3}}{2}\phi_m} \Rightarrow$$

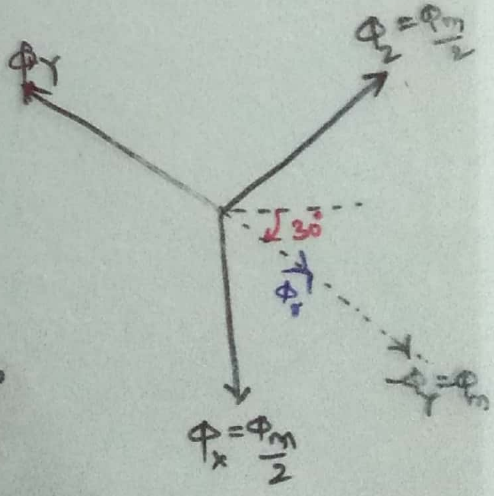
$$\Rightarrow AB = \frac{3}{4}\phi_m$$

$$\Rightarrow AD = 2 \times (AB)$$

$$= 2 \times \frac{3}{4}\phi_m$$

$$\phi_r = \frac{3}{2}\phi_m$$

$$\boxed{\phi_r = 1.5\,\phi_m}$$



$\therefore$ Illy At instant 2, $\omega t = 30^\circ$

$\phi_x = \phi_m \sin(30) = \frac{\phi_m}{2}$

$\phi_Y = \phi_m \sin(30 - 120) = -\phi_m$

$\phi_Z = \phi_m \sin(30 - 240) = \frac{\phi_m}{2}$

The phasor sum of ϕ_x, $-\phi_Y$ and ϕ_Z is resultant flux. ϕ_r

phasor Sum of ϕ_x and ϕ_Z, $\phi_r' = \frac{\phi_m}{2}$

phasor Sum of ϕ_r' and $-\phi_Y$, $\phi_r = \frac{\phi_m}{2} + \phi_m = 1.5\phi_m$.

Note that resultant flux is displaced by 30° clockwise from position 1.

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