ID 13748 (1)

Name. Hamza Ishaq

Electrical Machine

Q No 1

Given data:

Core length : 55cm = 0.55 m

Cross area 150cm$^2$ = 1.5 m$^2$

N = 200 turns

$\Phi$ = 0.012 Webers

intensity = H = 115 A·turns/m

Required:

B = ?

H = ?

R = ?

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Name Hamza Tahir

Electrical Machine

Sol:-

$$\Phi = BA$$

$$\Rightarrow B = \frac{\Phi}{A}$$

$$= \frac{0.012}{1.5}$$

$$\boxed{B = 0.008 \text{ Tesla}}$$

$$B = \mu H$$

$$\mu_r = \frac{B}{H}$$

$$= \frac{0.008}{115}$$

$$\mu = 0.000069$$

Now

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$$\mu_r = \frac{\mu}{\mu_0}$$

$$= \frac{0.000069}{4 \times 10^{-7}}$$

$$= \frac{0.000069}{0.0000004}$$

$$\boxed{\mu_r = 172.5}$$

(b) $T = HL$

$= 115 \times 0.55$

$T = 63.25$ A turns

$T = R\Phi$

$R = \frac{T}{\Phi}$

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$$= \frac{63.25}{0.012}$$

$$R = 5270 \ \frac{A\text{-turns}}{\text{webers}}$$

Q.2

Impedance - Turn - ratio

$$\frac{VP}{VS} = \frac{NP}{NS} = \alpha$$

$$\frac{VP}{VS} = \alpha$$

$$VP = \alpha VS \quad \text{—— (1)}$$

$$\frac{IS}{IP} = \alpha \ \frac{NP}{NS} = \alpha$$

$$\frac{IS}{IP} = \alpha$$

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$$I_P = \frac{I_S}{\alpha} \quad -(2)$$

$$Z_P = \frac{V_P}{I_P} \quad -(3)$$

Now put equation (1) and (2) in (3)

$$Z_P = \frac{\alpha V_S}{I_S/\alpha}$$

$$Z_P = \alpha V_S \div \frac{I_S}{\alpha}$$

$$Z_P = \alpha V_S \times \frac{\alpha}{I_S}$$

$$Z_P = \alpha^2 \frac{V_S}{I_S}$$

$$Z_P = \alpha^2 \frac{V_S}{I_S}$$

$$Z_P = \alpha^2 Z_S$$

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Electrical Machine

$$\sqrt{\frac{Z_P}{Z_S}} = \sqrt{\alpha^2}$$

$$\sqrt{\frac{Z_P}{Z_S}} = \alpha$$

$$\frac{N_P}{N_S} = \sqrt{\frac{Z_P}{Z_S}} \quad \because \alpha \frac{N_P}{N_S}$$

Q.3

POWER FACTOR:-

Power factor is an expression of energy efficiency It is usually expressed as a percentage - and the lower the percentage the less efficient power

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power usage is.

power factor (PF) is the ratio of working power measured in kilowatts (KW) to appearent power measured in kilovot amperes (KVA). Appaent power. also known as demand is the measure of the amount of power used to run machinery and equipment during a certain period.

It is found by multiplying (KVA=VxA)

The result is expressed as KVA units

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## DIFFERENCE B/W ACTIVE & REACTIVE POWER:

The most significant difference b/w the active and reactive power is that the active power is the actual power which is dissipated in the circuit. whereas, the reactive power is the useless power which only flows b/w the source and load.

The other differences b/w the active and reactive power are explained below in the comparison chart

The active, apparent and real power induces in the circuit only when

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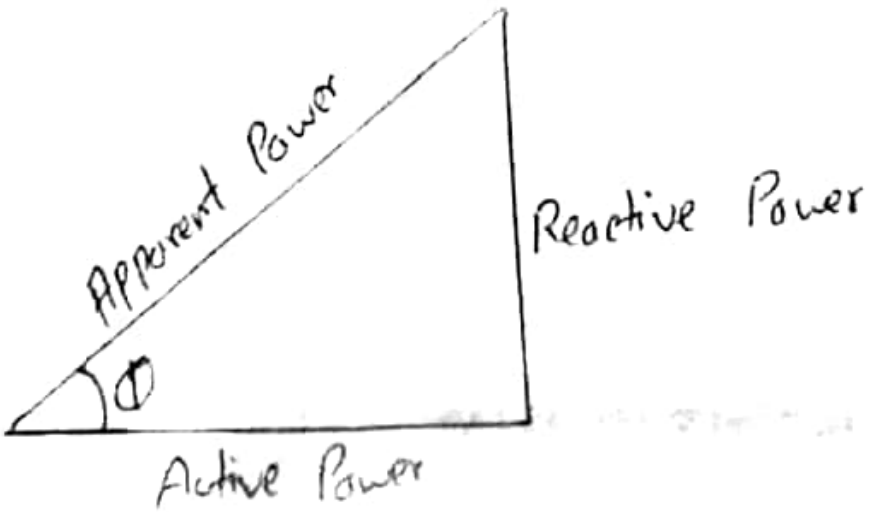
their current lags behind the applied voltage by an angle of Φ
The right-angled triangle shown below shows the relation b/w the active reactive and apparent powes.



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$$S = P + jQ$$

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

Where, S - apparent power

Q - reactive power

P - Active Power