NAME FAWAD AHMAD

ID 14231

SUBJECT ELECTRICAL MACHINE

Q1:- A sequence ferromagnetic core has a mean path length of 55cm - -

c. What is its reluctance?

GIVEN DATA:-

$l = 55\,cm$

$A = 150\,cm^2$

$Ni = 200$ turn

$\phi = 1.012$

$\mu = 115$

Then find

$B = ?$

$\mu_r = ?$

$R = ?$

SOLUTION:-

$$B = \frac{\emptyset}{A}$$

$$B = \frac{1.012}{0.015}$$

$$(B = 67.4T)$$

$$\mu_r = \frac{\mu}{\mu_0} \qquad \mu = \frac{B}{H} = \frac{67.4}{115}$$

$$\mu_r = \frac{0.586}{4\pi \times 10^{-7}} \qquad \mu = 0.586$$

$$\mu_r = 0.00000046$$

$$(\mu_r = 4.6 \times 10^{-8})$$

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

$T = HL$

$T = 115 \times 0.55$

$T = 63.25$

$R = \frac{63.25}{1.012}$

$R = 62.5$

Q2°- Derive voltage and Impedence relationship with turn ratio for an ideal transformer?

ANS°- IMPEDENCE - TURN RATIO:-

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} = \alpha$$

$$\frac{V_p}{V_s} = \alpha$$

$$V_p = \alpha V_s \quad -(1)$$

$$\frac{I_s}{I_p} = \frac{N_p}{N_s} = \alpha$$

$$\frac{I_s}{I_p} = \alpha$$

$$I_p = \frac{I_s}{\alpha} \quad -(2)$$

$$Z_p = \frac{V_p}{I_p} \quad -(3)$$

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

$$z_p = \frac{\alpha V_s}{I_s/\alpha}$$

$$z_p = \alpha V_s \times \frac{\alpha}{I_s}$$

$$z_p = \alpha V_s \times \frac{\alpha}{I_s}$$

$$z_p = \alpha^2 \frac{V_s}{I_s}$$

$$z_p = \alpha^2 z_s$$

$$\sqrt{\frac{z_p}{z_s}} = \sqrt{\alpha^2}$$

$$\sqrt{\frac{z_p}{z_s}} = \alpha$$

$$\therefore \alpha \frac{N_p}{N_s}$$

$$\frac{N_p}{N_s} = \sqrt{\frac{z_p}{z_s}}$$

Q 3:- Define power factor?
Differentiate between Real,
Apparent and reactive powers?

ANS:- POWER FACTOR:-

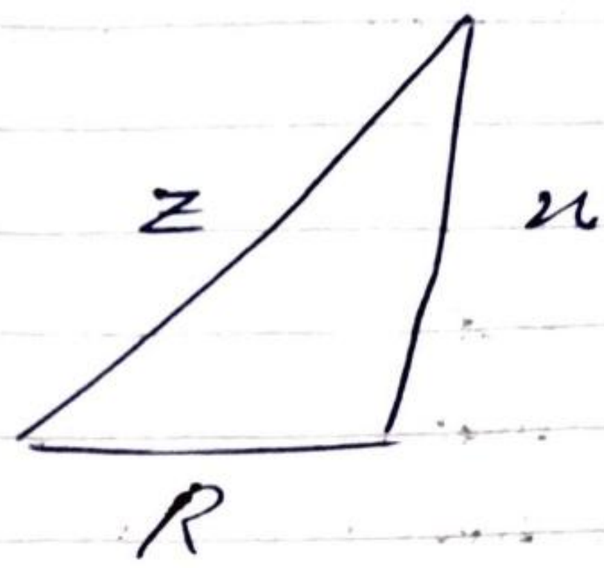
The ratio of the actual electrical power dissipated by an AC circuit to the product of the r.m.s values of current and voltage. The difference between the two is caused by reactance in the circuit and represents power that does no useful work.

REAL POWER:-

The power which is actually consumed or utilised in an AC circuit is called Real power. It is measured in Kilowatt (KW) or MW. It is the actual outcomes of the electrical system which runs the electric circuit or load.

$$Z = R + jx$$

$$Z^2 = R^2 + x^2$$



REACTIVE POWER:-

The power which flows back and forth that is / means it moves in both the directions in the circuit or reacts upon itself, is called Reactive power.

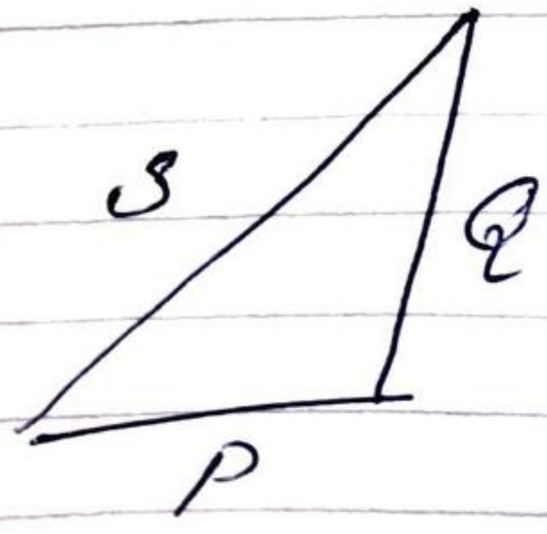
The reactive power is measured in kilo volt-ampere reactive (kVAR) or MVAR.

$$S = P + jQ$$

$$S = VI\cos\theta + VI\sin\theta$$

$$P = (Ie^{j\alpha})(Ve^{j\beta})$$

$$= VIe^{j(\alpha+\beta)}$$



APPARENT POWER:-

The ~~power~~ product of (RMS) root mean sq vare value of voltage and current is known as Apparent power. This power is measured in KVA or MVA.