Date: _____

Name :- Aqib Shukaib
ID :- 6978
Subject :- Electrical Machines.

Q1 :-

Total core length = 55cm = 0.55m
Cross area = 150cm² = 0.015m²
No of turns = 200 turns
$\varphi = 0.012$
intensity = H = 115 A turns/m

Required

B = ?
μ_r = ?
R = ?

Sol :- $\varphi = B \cdot A$

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

$= \frac{0.012}{0.015}$

B = 0.8T

$B = \mu H$

(i) $\mu = \frac{B}{H} = \frac{0.8}{115}$

$\mu = 0.0069567$

Now

$$\mathcal{T} = HL$$

$$\mathcal{T} = 115 \times 0.55$$

$$\mathcal{T} = 63.25 \text{ A. turns}$$

Req current :-

$$i = \frac{\mathcal{T}}{N} = \frac{63.25}{200} = 0.316 \text{ Amp}$$

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

$$= \frac{0.0069562}{4 \times 10^{-7}}$$

$$= \frac{0.0069562}{0.0000004}$$

$$\mu_r = 546.0869 \times 10^{-12}$$

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

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

$$R = 5270 \text{ A. Turns/Webers}$$

Date:_____

Question 2:-

Voltage and Impedance Relationship for an ideal Transformer:-

Sol:- $\frac{V_P}{V_S} = \frac{N_P}{N_S} = \alpha$

$\frac{V_P}{V_S} = \alpha$

$V_P = \alpha V_S$ ——(1)

$\frac{I_S}{I_P} = \frac{N_P}{N_S} = \alpha$

$\frac{I_S}{I_P} = \alpha$

$I_P = \frac{I_S}{\alpha}$ ——(2)

$Z_P = \frac{V_P}{I_P}$ ——(3)

Putting eq (1) and (2) in the eq (3)

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

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

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

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

$$Z_p = \alpha^2 Z_s$$

$$\sqrt{\frac{Z_p}{Z_s}} = \sqrt{\alpha^2}$$

$$\sqrt{\frac{Z_p}{Z_s}} = \alpha \qquad \because \alpha \frac{N_p}{N_s}$$

$$\frac{N_p}{N_s} = \sqrt{\frac{Z_p}{Z_s}}$$

So $\alpha = \sqrt{\frac{Z_p}{Z_s}}$

Date: _____ (5)

Question 3:-

Ans:- Power factor is an expression of energy expressed as a percentage, and the lower the percentage, the less efficient power usage.

It is the ratio of working power, measured in kilowatts. It expresses the ratio of true power used in a circuit to the apparent power delivered to the circuit.

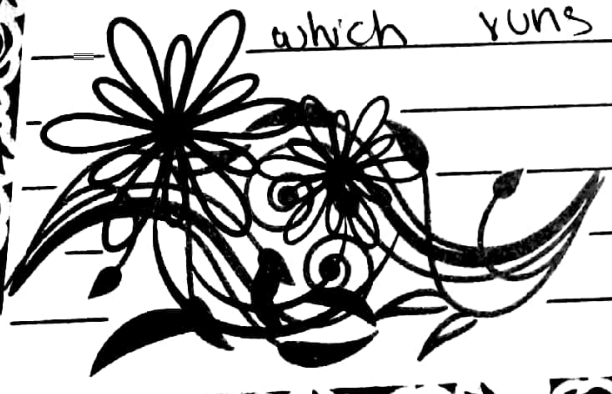
Calculating power factor:-

The power factor formula can be expressed

$PF = W/VA$

1) Real Power:-

The power which is actually consumed or utilised in an AC circuit is called Real power It is measured in Kilowatt or Mega watt. It is the actual outcomes of the electrical system which runs the electric circuits.



(2) Reactive Power :-

It is the power which flows back and forth that means it moves in both directions in the circuit or reacts upon itself is called reactive power. It is measured in Kilo-Volt ampere reactive (KVAR) It doesnt perform any useful work in circuit.

(3) Apparent Power :-

It is also known as demand power. The amount of power used to run machinery and equipment during a certain period. It can be calculated by (KVA = V×A). The result is expressed in KVA units.

Power Triangle