Name: M.HAROON
ID: 16216
Assignment: DC machines & Transformers
Module: 2nd Btech (E)
Instructor: Engr. waleed jan

Q1:(a) Why replacing winding in a shell type transformer is not an easy job? Explain briefly.

Ans: The shape of this transformer is rectangular and it includes three essential parts like one core and two windings which are shown in the following figure. It has two windings namely primary and secondary. The arrangement of these windings can be done in one limb. The coils of this transformer can be wounded in the form of the multi-layer disc where these layers are insulated through the paper from eachother.

These transformers are used for high ratings and low voltage and cooling is not effective in this type of transformer. The winding of a shell-type transformer is distributed type, so that heat can be naturally dissipated. This transformer is also called a sandwich otherwise disc winding. Maintaining these transformers is difficult and mechanical

ID: 16216 Name: HAROON

Strength is high. The cooling system used in the shell type transformer is forced air otherwise forced oil due to the surrounded winding through limbs and yoke.

⟸⟹

Q1: (b) Why the width of the central limb in a shell type transformer is double to the width of the other limbs? Explain briefly.

Ans: Shell type transform, the windings are put around the center limb and the flux path is completed through two side limbs. The centre limb carries the total magnetic flux while side limbs (cores) forms a part of the parallel magnetic circuit, carry half of the total flux. Consequently, the width hence cross-sectional area of the central limb is double that of outer side of limb.

⟸⟹

Q2: In a transformer, when primary voltage is stepped up, primary current is stepped down. Moreover, the efficiency of distribution transformer is 60 to 70%

ID: 16216   Name: HAROON

and not 100%. Justify these statements?

Ans: In transformer when primary voltage is stopped up and primary current stepped down. A step down transformer has less turns on the secondary coil that the primary coil. The induced voltage across the secondary coil is less the applied voltage across the primary coil or in other words the voltage is "stepped down".

In a distribution transformer the efficiency if 60 to 70% not 100%

difference between power and distribution transformer is distibution transformer is designed for maximum efficiency at 60% to 70% load as normally doesn't operate at full load all the time its load depends on distribution demand.

⟺

Q3: A single phase, 50Hz transformer is built on an iron core having an effective cross sectional area of 120 cm^2. The voltage on the primary side is 3000V while on secondary side is 200V. The number of

ID: 16216 Name: HAROON

turns on the low voltage side are 50. calculate:

a) The number of turns on the high voltage side.

b) The value of maximum flux density.

Ans: (A)

Given data:

-> single Phase transformer

$F = 50 Hz$

-> cross sectional area $= A = 120 cm^2$

-> Voltage on primary side $= V_p = 3000V$

-> voltage on secondary side $= V_s = 200V$

-> No of turns $= n = 50$ -> on low voltage side.

Calculate:

1) no of turns of high voltage side

2) Max flux density value $= P = ?$

Sol:- As we know that

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

$$\rightarrow \frac{3000}{200} = \frac{NP}{50}$$

$$\rightarrow \frac{50 \times 3000}{200} = NP$$

$$\rightarrow \left[NP = \frac{1500}{2}\right]$$

$$\rightarrow NP = 750$$

ID:16216 Name:HAROON

So the no of turn of high voltage side = NP = 750

Now to find the flux density of a transformer.

b) Maximum flux density.

Now:

$\phi = ?$

$\rightarrow V_1 = 4.44 = \phi N_1$

$\Rightarrow \phi = \frac{V_1}{4.44 \times F \times N_1}$

$\Rightarrow \phi = \frac{3000}{4.44 \times 50 \times 750}$

$\rightarrow \phi = \frac{30}{1665}$

$\rightarrow \phi = 0.02$ Tesla

Now:

$\rightarrow V_2 = 4.44 F \phi N_2$

$\rightarrow \phi = \frac{V_2}{4.44 \times F \times N_2}$

$\rightarrow \phi = \frac{200}{4.44 \times 50 \times 50}$

Date: / /

Day

ID:16216 Name: HAROON

$\Rightarrow \phi = \frac{2}{11}$

$\Rightarrow \phi = (0.02)$ Tesla.

$\Longleftrightarrow$

ID: 16216 Name: HAROON

Q4:(a) what will happen if the core of a transformer has infinite permeability? Explain briefly.

Ans: The core of the ideal transformer has infinite permeability. The infinite permeable means less magnetizing current requires for magnetizing their core. The leakage flux of the transformer becomes zero i-e. the whole of the flux induces in the core of the transformer links with their primary and secondary winding.

⟷

Q4:(b) Why the magnetizing current (I_μ) lags behind input voltage (V_1) by 90° in an ideal transformer? Explain briefly.

Ans: Commutator acts as a reversing switch. Its action in generator is as below:

In a DC generator, the emf induced in the armature coil is alternating in nature. Accordingly, the current flowing in the armature coil is also alternating current. Commutator reverses this current at the exact instant when the armature coil crosses the magnetic neutral axis. Therefore, the load (which

ID: 16216 Name: HAROON

is external to the generator) gets a unidirectional current or direct current. If the commutator will not present then it will not reverses this current at the exact instant and the armature coil cannot crosses the magnetic neutral axis. Therefore the load get not unidirectional.

⟸⟹

Q5: (a) What will happen if pole shoes are not present in a DC machine? Explain briefly.

Ans: In DC Machine, one is pole core and second is pole shoe.
Functions are as below:
Pole core basically carries a field winding which is necessary to produce the flux.
It directs the flux produced through air gap to armature core, to the next pole.
Pole shoe enlarges the area of armature core to come across the flux, which is necessary to produce large induced e.m.f to achieve this, pole shoe has been given a particular shape.

Date: / /

Day

ID: 16216

Name: HAROON

⟸⟹

Q5:(b) What will happen if a commutator is not present in a DC generator?

Ans: A commutator used in a DC generator is a rotatary electrical Switch in certain types of electric motor and electrical generators that periodically reverses the current direction between the rotor and the external circuit.

It consists of a cylinder composed of multiple metal contact segments on the rotating armature of the machine. So if the commutator is not used in a DC generator then the reversibility of the direction will not occure between the rotor and external circuit.

⟸⟹