Answer No 1

In this motor the rotor does not recieve electric power by Conduction but by Induction in exactly as the Secondary of 2-winding transformer receives its Power form the Secondary. That is why Such moters are known as roatating transformer when u give three Phase Supply of the three Phase Stator winding then it is Called a three Phase Induction motor. The effect of applying load on the Speed Slip Stator Current, Power factor efficiency and torque are discussed below

Advantages

1) The most obvious is the fact that the rotor Speed does not lag,

II) Variable Speed by Changing the frequency.

III) Another is not requiring brushes/Commutator to change the magnetic Poles to keep the motor running and Simplifies the Construction with less wear and tear

IV) Due to the absence of brushes there are no Sparks in the motor it Can also be operated in hazardous Conditions.

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Dis Advantages

i) A Single Phase Induction motor unlike a 3Phase Induction motor does not have a Self Starting torque

II) During light load Conditions the Power factor of the motor drops to a very low value.

III) Speed Control of an Induction motor is very difficult to attain the lack of starting torque

The disadvantages is that they are larger than DC motors for the Same Power.

Answer No 3

Solution:-

100 alterations minute $= \frac{100}{60}$ Cycles Sec

$1.6667\ Hz = sf$

Hence the Slip

II) Rotor Speed $S = \frac{1.6667}{50} = 0.3333$ Pu or 3.333%

$N = (1-S)N_s = (1-0.03333) \cdot 1000$

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Since $N_s = \frac{120 \cdot 50}{6} = 1000$ rpm. $N = 966.67$ rpm

III) rotor Copper losses Phase $= \frac{1}{3}$ (3 rotor Input)

total rotor Power Input = 80kw

rotor Power Input Per Phase = 80 3kw

rotor Copper losses Per Phase =

$$\frac{0.0333 \cdot 80}{3} kw = 0.8888 kw$$

Answer No 4

The working Principle of an alternator is very Simple it is just like the basic Principle of DC generator it also depends upon faraday's law of electromagnetic Induction which says the Current is Induced in the Conductor inside a magnetic field when there is a relative motion between that Conductor and the field

For Understanding working of alternator let us think about a Single rectangular turn Placed in between two opposite magnetic Poles as Shown above.

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The main Parts of an alternator abviously Consists of a Stator and a rotor But unlike other machines in most of the alternators field exciters are rotating and the armature Coil is Stationary.

Stator: Unlike in a DC machine the stator of an alternator is not meant to Serve a Path for magnetic flux Instead the stator is used for holding armature winding. The stator Core is made up of lamination of Steel alloys or magnetic iron to minimize the eddy Current losses.

Rotor: There are two types of rotor used in an AC Synchronous generator/alternator.
i) Salient and (II) Cylindrical type

Answer No 5

Solution: $F = PN/120 = \frac{16 \times 375}{120} = 50Hz$

Since Ke is not given would be taken as unity.

$n = \frac{144}{16} = 9$; $\beta = 180°/9 = 20°$; $m = \frac{144}{16 \times 3} = 3$

$K_d = \frac{\sin 3 \times (20°/2)}{3 \sin (20°/2)} = 0.96$

$Z = 144 \times 10/3 = 480$. $T = \frac{480}{2} = 240$/Phase

$E_{ph} = 4.44 \times 1 \times 0.96 \times 50 \times 0.03 \times 240 = 15.34V$

Line Voltage $E_L = \sqrt{3} E_{ph} = \sqrt{3} \times 1534 = 2658V$

Answer No 6

The Primary and Secondary windings of a transformer Can be Connected in different Configuration as Shown to meet Practically an requirement in the Case of three Phase transformer winding three forms of Connection are Possible "Star" (wye) "delta" (mesh) and " InterConnected star" (Zig-Zag)

The Combinations of the three windings may be with the Primary delta Connected and the

Secondary star - Connected or star-delt, Star-star or delta-delta depending on the transformer use when transformers are used to Provide three or more Phases the are generally reffered to as a Polyphase Transformer.

Three Phase Transformer Star & delta Configurations

But what do we mean by star and delta when dealing with three Phase transformer Connections A three phase th transformer has three sets of Primary and Secondary winding Depending upon how these sets of windings are interconnected determines whether the Connection is a star or delta Configuration.

The three available voltages which themselves are each displaced from the other by 120 electrical degrees not only decided on the type of the electrical Connections used on both the Primary and Secondary Sides but determine the flow of the transforme Current.

with three Single Phase transformers Connected together the magnetic flux's in the in the three transformers differ in Phase by 120 time degrees with a Single the three Phase transformer there are three magnetic flux in the Core differing in time Phase by 120 degrees.

Transformer Delta and Delta Connections:-

In a delta Connected (Dd) group of transformer the line voltage V_L is equal to the Supply Voltage $V_L = V_S$ But the Current in each Phase winding is given $1/\sqrt{3} \times I_L$ of the line Current where I_L is the line Current.

Answer No 7

Solution:-

Transformation ration $K = \frac{11{,}000}{\sqrt{3} \times 33{,}000} = \frac{1}{3\sqrt{3}}$

Per Phase $R_{02} = 0.876 + \left(\frac{1}{3\sqrt{3}}\right)^2 \times 35 = 2.172\Omega$

Secondary Phase Current $= \frac{500{,}000}{\sqrt{3} \times 33{,}000} = \frac{500}{11\sqrt{3}}$ A

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Full load Condition

Full load total Cu loss =

$= 3 \times \left(\frac{11}{\sqrt{3}}\right)^2 \times 2.172 = 4,490$ W ; Iron loss = 3,050 w

Total full load losses

= 4,490 + 3,050 = 7,540 w; output at unity p.f = 500 kw

★ F.L Efficiency = 500,000/507.540

= 0.9854 or 98.54% ; output at 0.8 p.f = 400 kw

★ Efficiency = 400,000/407.540

= 0.982 or 98.2 %.

Half load Condition

output at unity p.f = 250 kw

Cu losses = $(1/2)^2 \times 4,490$

= 1,222w

Total loss

= 3,050 + 1,122 = 4,172 w

N = 250.000/254,172 = 0.9835 = 98.35%

output at 0.8 p.f = 200 kw ∴ n = 200,000/204.172

= 98%

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Answer No 8

I) There is a requirement of two types of System for the generation of e.m.f
The magnetic System is required for the Production of the magnetic field Armature System is required for the houses of Conductors on which the Emf is to be Induced

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(II) Generally in altermators the armature is Stationary and the field rotates Small low voltage altermators often have a rotating armature and a Stationary field winding But in large altenation rotating armature field type is used

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(III) alternators are generally high Current and high voltage machines The Stationary armature rotating field Construction has many advantages A few of them Include

(a) The Current is draw directly from fixed terminals on the stator without the use of brush Contacts.

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(B) The Insulation of stationary armature winding is easier

(C) The number of Sliding Contacts is reduced Moreover the Sliding Contacts are used for low voltage DC Source.

IV)

(a) PolyPhase motors have uniform whereas most of the Single Phase motors have Pulsating torque.

(b) Comparing with Single Phase motor, three Phase Induction motor has higher Power factor and efficiency.

(C) PolyPhase Induction motors are Self Starting and are more efficient Single Phase motor has no starting torque and requires an auxiliary means for starting.

V) Turbo alternator: The alternator which Coupled directly to the Steam turbines are Called turbo-alternator. The turbine Converts heat energy in the Steam into mechanical work and the alternator Converts mechanical energy into electrical energy.

Answer No 2

Solution:-

Since N is 290 rpm Ns has to be Somewhere near it Say 300 rpm If Ns is assumed as 300 rpm then

$$300 = \frac{120 \times 50}{P}$$

$$\therefore P = 20$$

$$\therefore \text{Slip} = \frac{300 - 290}{300} = 3.33\%$$