

Department of Electrical Engineering
Assignment
Date: 14/04/2020

Course Details

Course Title:	<u>AC Machines</u>	Module:	<u>B-Tech</u>
Instructor:	<u>Rashid aleem</u>	Total Marks:	<u>30</u>

Student Details

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(Q1) Fill in the blanks?(5 Marks)

- (1) Induction motor was invented by In
- (2) The Stator of the induction motor is ,in principle ,the same as that of
- (3) Greater the no of poles in induction machinethe speed.
- (4) The stator winding when supplied with three phase currents produce a magnetic flux which hasmagnitude.
- (5) Motors employing wound rotor are known as Motors.

(Q2) Multiple choice questions?(5 Marks)

- (1) Regarding skewing of motor bars in squirrel cage induction motor ,which statement is false?
(a) it prevents cogging (b) it increases starting torque (c) it produces more uniform torque (d) it reduces motor 'hum' during its operation
- (2) The principle of operation of a 3-phase induction motor is most similar to that of a
(a) synchronous motor (b) repulsion start induction motor (c) transformer with a shorted secondary (d) capacitor –start ,induction run motors

(3)The magnetizing current drawn by transformers and induction motors is the cause of their power factor

(a)zero (b)unity (c)lagging (d)leading

(4)The effect of increasing the length of air-gap in an induction motor will be to increase the

(a)power factor (b)speed (c)magnetizing current (d)air gap flux

(5)In a three phase induction motor, the relative speed of stator flux with respect to is zero.

(a)stator winding (b)rotor (c)rotor flux (d)space

(Q3)In case of AC generator the input domain is mechanical, identify the potential and kinetic variable for input and output and explain the relationship of input and output?(5 Marks)

(Q4)Is it true that conduction takes place in ac machines. Back your reason with valid facts? Explain the working of synchronous machines and give solid reason why it uses separate dc source?(5 Marks)

(Q5)The stator of a three Phase induction motor has 6 slots per pole per phase. If supply frequency is 60Hz. Calculate the number of stator poles produced and total number of slots on the stator. Calculate the speed of the rotating stator flux?(5 Marks)

(Q6)3-Phase, 50Hz, 8 pole, induction motor has full load slip of 2%. The rotor resistance and stand still rotor reactance per phase are 0.001 ohm and 0.005 ohm respectively. Find the ratio of the maximum to full load torque and the speed at which the maximum torque occurs? (5 Marks)



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Q. No 1 Fill in the blanks?

I Induction motor was invented by NIKOLA TESLA
in 1887

II The stator of the induction motor is in
Principle the same as that of SYNCHRONOUS MOTOR

III Greater the no of poles in induction machine
LESSER the speed.

IV The stator winding when supplied with
three phase currents produce a magnetic flux
which has CONSTANT magnitude.

V Motors employing wound rotor are known as
PHASE WOUND MOTOR
Slip winding motor

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Q2 Multiple Choice Question?

I Regarding skewing of motor bars in Squirrel Cage Induction, which statement is false

~~(a)~~ (b) it increase starting torque

(c) The principle of operation of a 3-phase induction motor is most similar to that of a

(c) Transformer with a Shorted Secondary

(d) The magnetizing current drawn by transformers and induction motors is the case of their

(c) lagging Power factor

iv The effect of increasing the length of air-

gap in an induction motor ~~will~~ be increased

(c) Magnetizing Current

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✓ In a three phase Induction motor, the relative speed of stator flux with respect to (b) Rotor is Zero.

Q No 3 The Stator of a three phase Induction motor has 6 Slots per Phase if supply frequency is 50Hz. Calculate the number of Stator Poles Produced and total number of Slots on the Stator. Calculate the speed of the rotating Stator Flux?

Solution: (i) $P = 2n$

$$P = 2 \times 3 = 6 \text{ Poles}$$

Total No of Slots

$$= 6 \text{ Slots per Phase} \times 6 \text{ Poles} \times 3 \text{ Phase}$$

$$= 108$$

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(II) we know that

$$N_s = \frac{120f}{P}$$

Now putting value we get

$$\frac{120 \times 60}{6} = 1200 \text{ r.p.m}$$

Q4 3-Phase, 50Hz, 8Pole Induction motor has Full Load

Slip of 2%. The rotor resistance and Stand Still

rotor reactance per Phase are 0.001 Ohm and 0.005 Ohm

respectively. Find the ratio of the maximum to Full

Load torque and the Speed at which the

maximum torque occurs?

Solution:- Synchronous Speed $N_s = 120 \times 50 / 8 = 750 \text{ rpm}$

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Slip at maximum torque. $s_{mt} = T_2 / K_2$

$$= \frac{82}{22} = \frac{0.001}{0.005} = 0.2$$

Corresponding speed = $(1 - 0.2) \times 750 = 600 \text{ r.p.m}$

$$\frac{\text{full load torque}}{\text{maximum torque}} = \frac{2s_{mt} \pi}{s_{mt}^2 + s^2 \pi} = \frac{2 \times 0.2 \times 0.2^2}{0.2^2 + 0.2^2}$$

$$= \frac{1.6 \times 10^{-4}}{0.0404}$$

$$\frac{T_{tmax}}{T_f} = 252.5$$

$$= 3.96 \times 10^{-3}$$

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Q5

Is it true that Conduction takes place in the ac machines Back your reason with valid facts? Explain the working of Synchronous machines and give solid reason why it uses separate dc source?

Ans: No it is not true Due to Conductor it transference from one molecule to another but here in ac machine we will use Induction because it produce emf.

Permanent-magnet Synchronous motor (PMSM) uses permanent magnets embedded in the stator rotor to create a constant magnetic field the stator carries windings connected to an AC supply to produce a rotating magnetic field. At synchronous speed the rotor poles lock to

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to the rotating magnetic field.
Synchronous Generator Working Principle
The Principle of operation of Synchronous Generator is electromagnetic Induction if there exists a relative motion between the flux and conductors then an emf is induced in the conductors. To understand the Synchronous generator working principle let us consider two oppositemagnetic poles in between them a rectangular coil of turn is placed.

Question (b) In case of AC generator the input domain is mechanical identify the potential and kinetic variable for input and output and explain the relationship of input and output?

Answer:



In case of AC generator it will convert mechanical power into AC electrical power.

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AC electrical Power of Alternating Cycle
electrical Power

AC means Alternating Cycle.

In Case of Generator:

The Input domain is mechanical domain

So therefore the Potential and kinetic variable
are torque and ω

output domain which is AC electrical Power

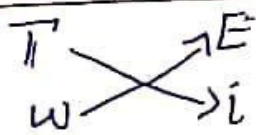
which will have Potential variable E

(Induced emf) and kinetic variable will be
Current.

$E \rightarrow$ (Induced emf) + Potential variable.

$i \rightarrow$ (current) \neq kinetic variable.

Relationship of Input and output:



we have a relation b/w

Torque and Current Emf and ω

