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

Course Details

Course Title:	AC Machines	**Module:**	B-Tech
Instructor:	RASHID ALEEM	**Total Marks:**	30

Student Details

Name:	NEHAD MUHAMMAD	**Student ID:**	14912

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

(1)Induction motor was invented by **Nikolateslain 1887**

(2)The of the induction motor is ,in principle ,the same as that of **synchronous motor or genrator**

(3)Greater the no of poles in induction machine **lesser** the speed.

(4)The stator winding when supplied with three phase currents, produce a magnetic flux which has **constant**magnitude.

(5)Motors employing wound rotor are known as **slip ring or phase wound** 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)

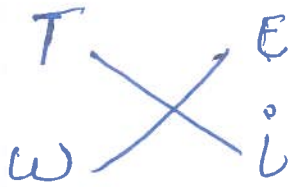
Question 3

Answer

In case of generator the input domain is mechanical domain so therefore the potential and kinetic variable are torque(T) and angular velocity (ω).

In case of A.C generator the output domain is electrical power which will have potential variable (E) (induced emf) and kinetic variable will be current (i)

Relationship of input and Output



Torque and current relation with each other on the other hand induced emf (E) and angular velocity related or relationship with each other

Question 4

Answer

It is not true that Conduction take place in a.c machine. Because in a.c machine the rotor does not recieve electric power by Conduction but by induction & therefore induction take place in a.c machine.

Working of Synchronous machine

Working of Synchronous machine depends on the interaction of the magnetic field of the stator with the magnetic field of the rotor. The Stator contain three phase winding and is supplied with 3 phase power.

Question 5

Given data

Number of slots / per / phase = 6

frequency = 60 Hz

Required data

* Number of Stator poles P = ?
* Speed of the rotating Stator flux = ?
* total number of slots = ?

Solution

* i) Number of Stator poles

We know that P = 2 × No of Stator

$$P = 2 \times 6$$

$$P = 12$$

* ii) Speed $N_s = \frac{120 f}{P}$ → 1)

Put value in 1)

$$= \frac{120 \times 60}{12}$$

$$= \frac{7200}{12}$$

$$N_s = 600 \text{ r.p.m}$$

iii) Total No of slot = No of slot/phase/pole x poles x phase

$= 6 \times 12 \times 3$

$= 216$

Question 6

Given data

Number of poles = $p = 8$

Frequency; $f = 50\ Hz$

Slip ; $S = 2\%$

Reactance per phase = 0.001 and 0.005

Required data

find the ~~rotat~~ ratio of the maximum to full load torque and the speed at which the maximum torque occurs.

Solution

Synchronous Speed $N_S = \frac{120f}{p}$

Now $N_S = \frac{120 \times 50}{8}$

$N_S = 750$ r.p.m

Now slip of maximum torque (m_T)

$S_{mT} = r_2 / x^2$

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

$S_{mT} = 0.2$

So $N = N_S (1 - S)$

$N = 750 (1 - 0.2)$

$= 750 \times 0.8$

$N = 600$ r.p.m

then we find maximum to full Load torque

$$\frac{\text{full-Load torque}}{\text{maximum torque}} = \frac{2 S_{mT} S_{fl}^2}{S_{mT}^2 + S_{fl}^2}$$

$$= \frac{2 \times 0.2 \times (0.02)^2}{(0.2)^2 + (0.02)^2}$$

$\frac{T_{max}}{T_f} = 252.5 = 3.96 \times 10^{-3}$