

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 121409

Roll No.

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B.TECH.**Theory Examination (Semester-IV) 2015-16****ELECTRO-MECHANICAL ENERGY CONVERSION-II****Time : 3 Hours****Max. Marks : 100****Section-A**

1. All questions are mandatory. (10×2 = 20)
- (i) What do you mean by positive and negative voltage regulation of a synchronous alternator?
 - (ii) Explain the basic role of damper winding in synchronous machines.
 - (iii) Write the main application of the three phase synchronous motor.
 - (iv) What do you understand by term mechanical vibration in a synchronous machine?
 - (v) Explain the equivalent circuit of a single phase induction motor.

(1)

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- (vi) Explain the principle of operation of a three phase induction motor.
- (vii) State the terms cogging and crawling in three phase induction motor.
- (viii) Give various application of three phase Induction motors.
- (ix) Draw the V-curve and inverted V-curve of a synchronous motor.
- (x) What are the importances of armature reaction in three phase synchronous machine?

Section-B

2. Attempt any five questions. (5×10 = 50)

- (a) Explain the constructional features and working principle of the synchronous motor and develop the Torque expression of synchronous motor.
- (b) Discuss the working principle of capacitor start capacitor run motor and also explain its equivalent circuit.
- (c) Explain the principle of operation of a universal motor. Draw and explain its operational characteristics.

(2)

- (d) Discuss the working principle of AC series motor. Also explain its characteristics and applications in a 3-phase induction motor show that

$$\text{Rotor current frequency} = \text{slip} \times \text{supply frequency}$$

- (e) Discuss the various methods of starting of a 3-phase induction motor.
- (f) Discuss the various methods of starting of a 3-phase induction motor.
- (g) A 3-phase, 4-pole, 60 Hz induction motor has a slip of 5% at no load, and 7% at full load. Determine the following :
- (i) The relative speed between stator surface and rotor field.
 - (ii) The relative speed between stator field and rotor field.
 - (iii) The relative speed between stator surface and rotor surface.
- (h) State & explain the MMF method for calculation of voltage regulation of synchronous alternator.

Section-C

Attempt any two questions.

(2×15 = 30)

3. State & explain forward and backward revolving field theory associated with single phase induction motors. Also draw & explain its torque-speed characteristics.
4. State & explain two reaction theories applicable to cylindrical synchronous machine. Also give the real power and reactive power flow equations of the cylindrical machine.
5. A 220V, 50 Hz, 6 pole, single phase induction motor has the following circuit model parameters as follows:

R_{1M}	3.6 ohms
R_2	6.8 ohms
$X_{1M} + X_2$	15.6 ohms
X_c	96 ohms

The rotational losses of the motor are estimated to be 75 watts. At a motor of 940 rpm, determine the line current, power factor, shaft power and efficiency.

(4)