



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

PAPER ID : 121409

Roll No.

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B. Tech.

**(SEM. IV) THEORY EXAMINATION, 2014-15
ELECTRO-MECHANICAL ENERGY CONVERSION - II**

Time : 3 Hours]

[Total Marks : 100

Note: (i) Attempt All questions

(ii) All questions carry equal marks.

1 Attempt any two parts. (10×2 = 20)

(a) Explain E.M.F. equation of Alternator.

A 3-phase, 50 Hz, 8-pole alternator has star-connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.05 Wb, sinusoidally distributed. Determine the phase and line voltages.

(b) Sketch and explain the open-circuit and short-circuit characteristics of a synchronous machine. How voltage regulation can be calculated by the use of their results.

(c) Explain the Potier-triangle method of determining the voltage regulation of an alternator.

- 2 Attempt any two parts. (10×2=20)
- (a) Explain the two reaction theory applicable to silent-pole synchronous machine.
 - (b) Explain starting method of synchronous motor and its working as synchronous condenser.
 - (c) Explain hunting of a synchronous machine. What are V-curves of a synchronous motor?

- 3 Attempt any four parts. (5×4=20)
- (a) Explain the principle of operation of a 3-phase induction motor.
 - (b) A 4-pole, 50 Hz induction motor runs with 4% slip at full load.
What will be the frequency of current induced in the rotor
 - (i) At starting
 - (ii) At full-load
 - (c) Develop the equivalent circuit for a 3-phase induction motor.
 - (d) Sketch the torque-slip characteristics of a 3-phase induction motor indicating there in the starting torque, maximum torque and the operating region.
 - (e) A 6-pole, 50 Hz induction motor runs with 5 percent slip. What is its speed? What is the frequency of the rotor current?
 - (f) Explain the voltage build-up of an isolated induction generator.

4 Attempt any two parts. (10×2=20)

- (a) Explain the phenomenon of crawling and cogging in a 3-phase induction motor.
- (b) Discuss briefly the various methods of speed control of 3phase induction motors.
- (c) If the outer cage has an equivalent impedance of $(0.6 + j0.6)$ ohm and the inner cage an equivalent impedance of $(0.1 + j0.8)$ ohm both at supply frequency, calculate the current and torque in synchronous watts for the two cages at standstill and at 10% slip. The effective standstill e.m.f. of each cage is 200 V.

5 Attempt any two parts. (10×2=20)

- (a) Why the 1-phase induction motor is not self-starting? Explain double revolving field theory.
- (b) Explain the operation of a stepper motor and state some important application of stepper motors.
- (c) Explain starting methods of 1-phase induction motor. What is Repulsion motor?