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Total No. of Questions : 09

B.Tech.(EE) (2012 Onwards (Sem.-4)

ASYNCHRONOUS MACHINES

Subject Code : BTEE-401

M.Code : 57104

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

- How is the direction of rotation of single phase induction motor reversed?
- What is the necessity of short-circuited rotor conductors in a squirrel cage induction motor?
- Why the air gap between stator core and rotor of an induction motor is very small?
- Why the power factor of an induction motor is less at starting?
- What is the information obtained from blocked rotor test in a 3-phase IM?
- Give applications of single phase capacitor start induction motor.
- Which winding in a double cage induction motor has high resistance and low inductance?
- What is meant by single phasing?
- Explain the terms 'transverse edge effect' and 'end effect' in linear induction motor.
- Why are high speeds often desirable in operation of universal motors?

SECTION-B

2. Explain the principle of operation of three phase induction motor.
3. Derive the expression for slip under maximum torque condition and also find the expression for the maximum torque.
4. Explain the principle of operation of self-excited induction generator. Under what condition will this generator may fail to build up.
5. Describe the working principle and characteristics of shaded pole motor.
6. Explain the construction and working principle of operation of stepper motor.

SECTION-C

7. An induction motor has an efficiency of 0.9 when delivering an output of 37kW. At this load, the stator copper loss and rotor copper loss each equals the iron loss. The mechanical losses are one-third of the no-load loss. Calculate the slip.

8. A star-connected cage induction motor has the following data :

$$R_s = 2 \, \Omega, R_r' = 2 \, \Omega, X_s = X_r' = 3 \, \Omega$$

Calculate starting torque and starting current of this motor at 10 Hz and 50 Hz for V/f control.

9. The constants of a 0.25 HP, 230 V, 4-pole, 60 Hz, single phase induction motor are as follows

$$R_1 = 10 \, \Omega, R_2 = 11.65 \, \Omega, X_1 = 12.8 \, \Omega, X_2' = 12.8 \, \Omega \text{ and } X_m = 258 \, \Omega$$

The total load is such that the machine runs at 3% slip, when the applied voltage is 210 V. The iron losses are 35.5 W at 210 V. Determine :

- a) Input current
- b) Power factor
- c) Developed power
- d) Output power
- e) Efficiency.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.