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B.Tech. (EE)   (Sem.–4)
ASYNCHRONOUS MACHINES
Subject Code : BTEE-401
M.Code : 57104
Date of Examination : 14-07-22

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 :**

   a) What is meant by slip frequency?

   b) Why closed slots are often used for small induction motors?

   c) Why induction motor is called asynchronous machine?

   d) What information can be obtained from blocked rotor test in a 3-phase I M?

   e) What will be the direction of rotation of a shaded pole single phase induction motor?

   f) How can the starting torque be improved of an induction motor?

   g) Explain the advantage of VVVF speed control of IM.

   h) Why an induction generator cannot be operated independently?

   i) Is single phase IM self starting? Give reason.

   j) Why compensating winding is provided in universal motors for ac operation?

SECTION-B

2. Why an induction motor called a generalized transformer? In what respect is the operation of the induction motor different than that of a transformer?

3. Differentiate the isolated and grid mode operation of induction generator.

4. Explain the working principle of deep bar rotor and double cage induction motor.

5. Explain the construction and principle of operation of universal motor.

6. Explain double field revolving theory of single-phase induction motor.

SECTION-C

7. A three-phase, 50 Hz, 400 V induction motor has a 4-pole star-connected stator winding. Rotor resistance and stand-still reactance per phase are 0.1 Ω and 1.0Ωrespectively. The full-load slip is 4%. Calculate the :

   a) power input to rotor

   b) total torque developed

   c) and the horse power developed at full load.

   Also, calculate the maximum torque and the speed at maximum torque. Assume that the stator to rotor turns ratio is 2:1.

8. a) Explain the pole changing method of speed control of three-phase induction motor.

   b) A 12 kW, 3-phase, 6-pole, 50 Hz, 400 V, delta-connected induction motor runs at 960 rpm on full load. If it takes 85 A on direct starting, find the ratio of the starting torque to full-load torque with a star-delta starter. Full-load efficiency and power factor are 88% and 0.85respectively.

9. A 230V, 50 Hz, 4-pole single phase induction motor has the following parameters:

   $R_1 = 2.5\ \Omega$, $R_2 = 7.81\ \Omega$, $X_1 = 4.81\ \Omega$, $X_2' = 4.62\ \Omega$ and $X_m = 150.88\ \Omega$

   Determine the main winding current and power factor when the motor is running at a slip of 0.05.

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.