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B.Tech. Degree VI Semester Examination April 2019

EE 606 ELECTRICAL MACHINES III (2006 Scheme)

Time: 3 Hours

Maximum Marks: 100

PART A (Answer ALL questions)

(8 × 5 = 40)

- I. (a) Describe the principle of operation of a 3-phase induction motor. Explain why the rotor is forced to rotate in the direction of rotating magnetic field.
- (b) Discuss the difference between 3-phase induction motor and transformers.
- (c) Why do you require starters for the starting of 3-phase induction motors? Name the different starters used for starting 3-phase induction motor.
- (d) Explain the constructional details of double cage induction motor.
- (e) Explain the principle of slip control by slip frequency emf injection in rotor circuit with neat sketches.
- (f) What are the types of single phase synchronous motors? Explain in detail.
- (g) A 230 V, 50 Hz, 4 pole single phase induction motor has the following equivalent circuit impedances:
 $R_{1m} = 2.2 \Omega$, $R_2' = 4.5 \Omega$, $X_{1m} = 3.1 \Omega$, $X_2' = 2.6 \Omega$, $X_m = 80 \Omega$
 Friction, windage and core loss = 40 W
 For a slip of 0.03 pu, calculate (i) input current (ii) power factor (iii) efficiency.
- (h) Explain the construction and working principle of Schrage motor.



PART B

(4 × 15 = 60)

- II. Explain Torque-slip characteristics of a poly phase induction motor. (15)
- OR
- III. A three phase, 400 V, induction motor gave the following test readings: (15)
 No Load: 400 V 1250 W 9 A
 Short circuit: 150 V 4 kW 38 A
 Draw the circle diagram. If the normal rating is 20.27 hp, find from the circle diagram, the full load values of current, power factor and slip.
- IV. Explain the methods of starting of 3-phase squirrel cage type induction motor. (15)
- OR
- V. A squirrel cage induction motor has a starting current of six times the full load current at a slip of 0.04. Calculate the line current and starting torque in pu of full load values for the following methods of starting. (15)
- (i) Direct switching
 (ii) Auto-transformer starting with motor current limited to 2 pu
 (iii) Star-Delta starting
- VI. With neat diagram explain the different methods of speed control of cage type 3-phase induction motor. (15)
- OR
- VII. Explain with equivalent circuit, the operation of Induction generator. (15)
- VIII. (a) Explain double field revolving theory. (7)
 (b) With neat sketches, explain single phase AC series motor. (8)
- OR
- IX. (a) With neat sketches explain Universal motor. (7)
 (b) Explain principle of operation of repulsion start induction motor. Mention its applications. (8)