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(REVISION — 2010)

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FIFTH SEMESTER DIPLOMA EXAMINATION IN ELECTRICAL AND ELECTRONICS ENGINEERING — MARCH, 2016

INDUCTION MOTORS

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. List different methods of measurement of slip.
2. Write the relation between stand still torque and maximum torque.
3. Name any two methods of speed control of stator side.
4. State the methods to improve the starting torque of a 3Φ slip ring induction motor.
5. State the applications of universal motor. (5×2=10)

PART — B

(Maximum marks : 30)

II Answer *any five* of the following questions. Each question carries 6 marks.

1. Explain the construction of a 3Φ slip ring induction motor.
2. A 4 pole, 3Φ, 415V, 50Hz. induction motor running at 1440 r.p.m. Calculate the speed of the magnetic field of the stator, frequency of rotor currents running and stand still.
3. Draw and explain torque slip characteristics of induction motor.
4. Explain the various losses in a induction motor.
5. Draw and explain slip ring induction motor starter.
6. Explain the double field revolving theory.
7. What could be the reasons if a split phase motor runs too slow ? (5×6=30)

PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT—I

III (a) Why does the rotor rotate in a 3Φ induction motor ? 7

(b) A 4 pole, 3-phase induction motor operates from a supply whose frequency is 60Hz. Calculate.

(i) The speed at which the magnetic field of the stator is rotating.

(ii) The speed of the rotor when the slip is 0.04.

(iii) The frequency of the rotor currents when the slip is 0.03.

(iv) The frequency of the rotor currents at stand still. 8

OR

IV (a) A 3 phase, 4 pole induction motor is supplied with 50Hz. 400 Volt systems. Calculate.

(i) Synchronous speed.

(ii) The rotor speed when the slip is 3%.

(iii) Rotor frequency when rotor runs at 1050 r.p.m. 8

(b) Describe the advantage and disadvantage of squirrel cage induction motor. 7

UNIT—II

V (a) A 1000 HP, 3 phase, 50 Hz. 16 pole induction motor has 0.02Ω rotor resistance and 0.15Ω rotor reactance at stand still. Full load torque is obtained at 360 r.p.m. Calculate.

(i) The ratio of maximum to full load torque.

(ii) The speed of maximum torque.

(iii) The rotor resistance to be added to get maximum starting torque. 8

(b) Draw and explain no load and blocked rotor test. 7

OR

VI (a) A 12 pole, 3 phase, 400 Volt, 50 Hz. star connected induction motor has rotor resistance and stand still reactance of 0.02Ω and 0.4Ω per phase respectively. Calculate.

(i) Speed of maximum torque.

(ii) Ratio of full load torque to maximum torque, if the full load speed is 495 r.p.m. 8

(b) Describe an expression between starting torque and maximum load torque. 7

Marks

UNIT—III

VII Draw the circle diagram for 5HP, 220 Volt, 50Hz, 4 pole, 3Φ star connected induction motor from the following test data.

No load : Line voltage 220V, Line current : 5A, Total input : 350W.

Blocked rotor : Line voltage : 110V, Line current : 26A, Total input : 1700W.

Estimate from the diagram for full load condition, the line current power factor and also the maximum torque in terms of full load torque. Assume stator and rotor cu. losses equal at stand still condition. 15

OR

VIII (a) Explain with neat sketch the operation of ordinary star delta starter. 7

(b) Explain the construction and working of a double cage induction motor. 8

UNIT—IV

IX (a) Explain the working and construction of repulsion motor. 8

(b) Sketch and explain the working of a split phase motor. 7

OR

X (a) Draw and explain the construction of capacitor start capacitor run motor. 8

(b) Explain and sketch the working of AC/DC motor. 7
