DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

INDUCTION MOTORS

[*Time* : 3 hours

(Maximum marks : 100)

[*Note :*— Graph sheet should be Supplied.]

PART — A

(Maximum marks : 10)

Marks

I   Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Define slip of an induction motor.

2. Define synchronous speed of induction motor.

3. Write down the ratio of starting Torque to maximum torque.

4. What is a universal motor ?

5. Why the power factor of an induction motor is low at starting ?   (5 × 2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain how, 3 phase current produce rotating magnetic field ?

2. Derive the condition for maximum torque produced by the three phase induction motor.

3. Explain the working of a DOL starter with neat diagram.

4. Explain the variation of rotor reactance and rotor power factor under standstill and running conditions.

5. Explain the power stages of three phase induction motor.

6. What is double cage rotor ? What are the advantages ?

7. State and explain double revolving field theory applied to single phase induction motor.
          (5 × 6 = 30)

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Explain with neat sketch the constructional details of a 3 phase squirrel cage induction motor.   9

(b) A 12 pole 3 phase alternator driven at a speed of 500 rpm supplies power to a 8 pole 3 phase induction motor. If the slip of the induction motor at full load is 3%, calculate the full load speed and the rotor frequency of the motor.   6

OR

IV (a) Explain how torque is produced in 3 phase induction motor.   5

(b) An 1100V, 50 Hz, Delta connected induction motor has a star connected slip ring rotor with a phase transformation ratio (stator to rotor) of 3.8. The rotor resistance and standstill reactance per phase are 0.012Ω and 0.25Ω are respectively. Calculate :

   (i) Rotor current at 4% with slip ring short circuited.

   (ii) Rotor power factor at slip 4 % with slip ring short circuited.

   (iii) Rotor current and power factor at start with slip ring short circuited.   10

UNIT — II

V (a) Draw neat power flow diagram of induction motor and explain the various stages.   5

(b) How the equivalent circuit parameters are obtained from test resuls ?   5

(c) 3 phase 50 Hz, 8 pole induction motor has full load slip of 4%. The rotor resistance and standstill rotor reactance are 0.01Ω and 0.1Ω respectively. Find the ratio of maximum to full load torque.   5

OR

VI (a) Draw and explain the complete torque - slip characteristic curve of an induction motor.   7

(b) An 18.65 Kw, 6 pole, 50 Hz, 3 phase slip ring indution motor runs at 960 rpm on full load with a rotor current per phase of 35 A. Allowing 1 Kw for mechanical losses. Find the resistance per phase of three phase rotor winding.   8

UNIT — III

VII (a) Explain with block diagram how speed is controlled by changing stator frequency.   4

(b) Distinguish between squirrel cage and slip ring induction motor.   6

(c) Why starter is necessary for starting 3 phase induction motors. Name the different types of starters.   5

OR

VIII Draw the circle diagram for a 7.46 Kw, 200 V, 3 phase, 50 Hz, slip ring induction motor star connected stator and rotor from the following test results.

No load readings : 200 V, 7.7A , $\text{Cos}\emptyset0 = 0.195$. Blocked rotor readings: 100 V, 47.6 A, $\text{Cos}\emptyset s = 0.454$. The ratio of primary to secondary turns = 1, stator resistance per phase is 0.38Ω and rotor resistance per phase is 0.24Ω. Calculate :

   (i)   Max Torque   (ii) Slip for Max Toque   (iii) Max power factor.   15

UNIT — IV

IX   (a) Explain the working principle of shaded pole induction motors.   8

     (b) Explain why there is no starting torque in a single phase induction motor.   7

OR

X   (a) Explain the construction, principle and application of capacitor start induction motor.   8

     (b) Explain with neat sketch the constructional details and working of universal motor.   7