TED (10) – 4039

(REVISION — 2010)

Reg. No. .....

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FIFTH SEMESTER DIPLOMA EXAMINATION IN ELECTRICAL AND ELECTRONICS ENGINEERING — APRIL, 2017

INDUCTION MOTORS

[*Time* : 3 hours

(Maximum marks : 100)

[*Note* :—A4 size graph sheet to be supplied.]

PART — A

(Maximum marks : 10)

Marks

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

1. State the working principles of a 3ϕ induction motor.
2. Write any two advantages of skewing the rotor conductors in squirrel cage induction motor.
3. Define synchronous watt.
4. Name any two methods of starting 3ϕ induction motor.
5. State any two applications of ac series motor. $(5\times2 = 10)$

PART — B

(Maximum marks : 30)

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

1. Explain the main parts of a 3ϕ slip ring induction motor.
2. Obtain the expression for rotor current frequency.
3. Derive an expression for torque at running condition of 3ϕ induction motor.
4. Explain the different stages of power distribution in a 3ϕ induction motor.
5. Explain the effect of supply voltage on torque and speed.
6. Explain the working of star-delta starter with diagram.
7. Explain the double-field revolving theory in single phase induction motor. $(5\times6 = 30)$

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Explain how the rotating magnetic field is produced in 3ϕ induction motor. 7

(b) If an emf in the stator of an 8-pole induction motor has a frequency of 50 Hz and that in the rotor is 1.5 Hz. Calculate the speed of the motor and its slip. 8

OR

Marks

IV (a) Compare cage and wound rotor induction motors. 6

(b) A 4 pole, 3ϕ induction motor operates from a supply whose frequency is 50 Hz. Calculate : (i) the speed of the stator magnetic field, (ii) rotor speed at 4% slip, (iii) frequency of rotor currents when the slip is 3%. 9

UNIT — II

V (a) Derive the condition for maximum torque in a 3ϕ induction motor. 7

(b) The power input to a 500V, 50Hz, 6-pole, 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and the friction and windage losses total 2 kW.
Calculate : (i) the slip, (ii) the rotor copper loss, (iii) shaft power and (iv) the efficiency. 8

OR

VI (a) Explain the effect of changes in supply frequency on torque and speed in 3ϕ induction motor. 7

(b) A 50 Hz, 8-pole induction motor has a full load slip of 4%. The rotor resistance and reactance are 0.01 ohm and 0.01 ohm per phase respectively. Find the ratio of maximum to full load torque and the speed at which the maximum torque occurs. 8

UNIT — III

VII (a) Describe speed control of 3ϕ induction motor by pole changing method. 5

(b) Explain no-load and blocked rotor tests of an induction motor with neat diagrams. 10

OR

VIII (a) What is the necessity of starters in 3ϕ induction motor ? 3

(b) A 3ϕ, 400V induction motor gave the following test readings :
No load : 400V, 1250W, 9A : short circuit : 150V, 4kW, 38A.
Draw the circle diagram, if the normal rating is 14.9 kW,
find (i) the full load value of current, (ii) power factor, (iii) slip. 12

UNIT — IV

IX (a) Explain the working of capacitor-start-capacitor run induction motor with figure. 8

(b) Explain the torque-speed characteristics of single-phase induction motor. 7

OR

X (a) Draw and explain the construction and working of an ac series motor. 8

(b) Explain the working of a universal motor. 7