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C09–EE–603

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BOARD DIPLOMA EXAMINATION, (C–09)

APRIL/MAY—2015

DEEE—SIXTH SEMESTER EXAMINATION

AC MACHINES—II

Time : 3 hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Explain briefly why synchronous motor is not self-starting.

2. Draw 'typical V' and 'inverted V' curves of a synchronous motor on no load and full load.

3. Explain briefly how synchronous motor can be used as a synchronous condenser.

4. Distinguish between induction motor and transformer in any three aspects.

5. Draw torque-slip curves of a 3-phase induction motor.

6. List various methods of speed control of a 3-phase induction motor.

7. List any four applications of shaded-pole induction motor.

8. Draw the circuit diagram of a single-phase split-phase induction motor and label the parts.

9. Classify single-phase induction motors based on starting methods.

10. What modifications are necessary in a d.c. series motor so that it may work satisfactorily on a.c.?

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* Explain briefly the phenomenon of hunting in a synchronous motor and how it is prevented. 3+2

(b) Calculate the induced e.m.f. in a 3-phase 50-Hz, 440-V star-connected synchronous motor having a resistance of 0·35 ohm and synchronous reactance of 8·2 ohm per phase, when the motor takes a current of 52·5 A at a power factor of 0·8 leading. 5

12. A 550-V, 3-phase system supplies 500 kVA load at 0·5 lagging power factor. A synchronous motor operating at 0·8 leading power factor and supplying 74·6 kW load at 90% efficiency is added to the system. Find the overall power factor, total kW and total kVA.

13. *(a)* Derive the relationship among rotor input, rotor copper losses and mechanical power developed in case of a 3-phase induction motor. 6

(b) Draw the equivalent circuit diagram of a 3-phase induction motor. 4

14. A 10-kW, 415-V, 3-phase, 50-Hz, 4-pole, star-connected induction motor gives the following test results (line values) :

No-load test : 415 V, 5 A, 720 W

Blocked rotor test : 200 V, 35 A, 4850 W

Construct the circle diagram for the motor and find the following for full-load conditions :

(a) Line current

(b) Power factor

(c) Slip

(d) Efficiency

Rotor copper loss at standstill may be taken equal to stator copper loss.

15. *(a)* Explain cascade method of speed control of a 3-phase induction motor. 5

(b) Derive the condition for maximum torque developed in a 3-phase induction motor. 5

16. A 6-pole, 3-phase induction motor develops 30 HP including mechanical losses totalling 2 HP at a speed of 950 r.p.m. on 550-V, 50-Hz mains. The power factor is 0·88. Calculate for this load *(a)* rotor copper loss, *(b)* total input to take stator losses of 2000 W, *(c)* efficiency, *(d)* line current, and *(f)* no. of cycles per minute of the rotor e.m.f.

17. Explain the working of a single-phase capacitor-start capacitor-run induction motor with a neat sketch.

18. Describe the principle of operation of stepper motor with neat diagram.

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