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Question Paper Code : 80840

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Third Semester

Mechanical Engineering

ME 2205/10122 ME 306 /EE 1205 A/080120013/ME 36 — ELECTRICAL DRIVES AND CONTROL

(Common to Mechanical Engineering (Sandwich), Production Engineering, Petrochemical Engineering, Petrochemical Technology, Chemical Engineering and Textile Technology)

(Regulations 2008/2010)

(Also common to PTME 2205 for B.E. (Part-Time) Third Semester Mechanical Engineering — Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are types of electrical drives?

2. List the factors to be considered for the selection of electrical drives.

3. State the advantages of electrical braking.

4. What is meant by plugging?

5. What are the functions of starter of a DC motor?

6. What is the advantage of three phase slip ring induction motor?

7. Draw the speed-torque characteristics of DC series motor by armature resistance method.

8. Draw the block diagram of phase controlled rectifier fed DC drives.

9. What is meant by slip power recovery scheme?

10. State all possible methods of speed control of 3-phase induction motors.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the thermal model of an electric motor for

(i) heating the electric motor when starting from cold. (8)

(ii) cooling the electric motor when it is switched off from the mains. (8)

Or

(b) (i) A constant speed drive operating at a speed of 500 rpm has a cyclic loading as given below (10)

200 Nm for 10 minutes

300 Nm for 20 minutes

150 Nm for 20 minutes

No load for 10 minutes

Estimate power rating of the motor.

(ii) What are the different classes of motor duty? (6)

12. (a) (i) Draw and explain the speed torque characteristics for d.c motors. (8)

(ii) Discuss how regenerative braking can be implemented in the case of d.c motors. (8)

Or

(b) Discuss the various methods of electrical braking with particular reference to a 3-phase induction motor. (16)

13. (a) Describe with diagram working of 3-point starter for DC shunt motor. (16)

Or

(b) With diagram explain auto transformer starter for three phase induction motor. (16)

14. (a) With circuit describe DC motor Ward-Leonard control system. (16)

Or

(b) Explain first quadrant chopper control of separately excited motor for continuous conduction. (16)

15. (a) Sketch and explain the circuit, using thyristor controller, to control the speed of a three phase induction motor by varying the stator voltage. Mention the merits and demerits of this method. Also sketch and explain the torque-speed characteristics when stator voltage control is used. (16)

Or

(b) Explain the following solid state methods of controlling speed of three phase induction motors, with suitable schematic diagrams :

(i) Cycloconverter static Scherbius drive (8)

(ii) Static Kramer drive. (8)

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