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Question Paper Code : 52948

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Mechanical Engineering

EE 6351 — ELECTRICAL DRIVES AND CONTROLS

(Regulation 2013)

(Common to Manufacturing Engineering, Mechanical and Automation Engineering, Petrochemical Engineering, Production Engineering, Chemical Engineering, Petrochemical Technology)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is an electrical drive?

2. Define the term 'short time duty'.

3. Draw speed-torque characteristics of a traction load.

4. What is meant by 'braking of electrical motor' ?

5. What is the necessity of starter for AC motors?

6. What are the protective devices in a DC motor Starter?

7. Give the Limitation of field control.

8. List the main applications of Ward-Leonard system.

9. Name the various speed control methods used in AC motors?

10. Write the different types of slip power recovery scheme.

PART B — (5 × 13 = 65 marks)

11. (a) Draw and explain how to classify the drives according to their duty and give examples. (13)

Or

(b) (i) The enclosure of a 10 kW motor is equivalent to a cylinder of 70 cm diameter and 100 cm length. The motor weighs 500 kg assuming that specific heat is 700 J/kg/°C and that the peripheral surface of the enclosure of the motor alone is capable of heat dissipation of 12.5 W/m²/°C. Calculate the heating time constant of the motor and its final temperature rise. Assume the efficiency of the motor as 90%. (5)

(ii) Show that for an electric motor, the relationship between temperature rise and time is an exponential function. (8)

12. (a) Explain the four quadrant operation in motor drives with diagram. (13)

Or

(b) (i) Discuss the dynamic braking of DC shunt motor. (7)

(ii) Describe the speed-torque characteristics of DC shunt and DC series motor with neat sketch. (6)

13. (a) Explain typical control circuits in starter for DC shunt and DC series motors. (13)

Or

(b) Explain typical control circuits in starters for the three phase slip ring induction motors. (13)

14. (a) (i) Describe with a help of a neat circuit diagram explain Ward-Leonard control of D.C. motors. (7)

(ii) Explain the working of rectifier fed DC shunt motor. (6)

Or

(b) Explain the speed control of D.C. shunt motors using D.C. choppers. (13)

15. (a) Explain the pole changing, stator frequency variation methods for controlling the speed of AC motor. (13)

Or

(b) Explain the slip power recovery control of slip ring induction motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A 220 V DC shunt motor takes 22 A at rated voltage and runs at 1000 rpm. Its field resistance is 100 ohms and armature circuit resistance is 0.1 ohms. Compute the value of additional resistance required in the armature circuit to reduce the speed to 800 rpm when the load torque is proportional to speed. (15)

Or

(b) A motor has a thermal time constant of 45 minutes. When the motor runs continuously on full load, its final temperature rise is 80° C

(i) What is the temperature rise after 1 hour if the motor runs continuously on full load?

(ii) If the temperature on one hour rating is 80° C, find the maximum steady state temperature at this rating?

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