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C 3270

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Third Semester

Mechanical Engineering

EE 1213 — ELECTRICAL DRIVES AND CONTROLS

(Common to Production Engineering)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any four advantages of electric drives.
2. What are the factors influencing the selection of electric drives?
3. Define regenerative braking of induction motors.
4. Draw the output characteristics of DC shunt motor.
5. List the starting methods available for induction motor.
6. Why are DC series motors not started without load?
7. How can speed be controlled in a DC shunt motor?
8. What is the function of starters in DC motors?
9. List the advantages of six pulse converter compared with three pulse converter.
10. Compare voltage source inverter (VSI) and current source inverter (CSI).

PART B — (5 × 16 = 80 marks)

11. (a) Draw and explain how to classify the drives according to their duty cycle and give examples. Explain four quadrant of operation of motor applicable for hoist. (16)

Or

- (b) Derive the expression for heating and cooling of an electric motor. Draw and explain the temperature rise of an electric motor starting from cold and the temperature rise curve of a motor having some initial temperature. (16)

12. (a) Explain the speed torque characteristics of DC shunt (separately excited) and series motor with neat diagram. (16)

Or

- (b) Draw and explain counter current and dynamic braking of an induction motor. (16)

13. (a) (i) Why are single phase induction motors not self starting? Draw the schematic diagram and explain split phase and shaded pole single phase induction motors? (8)
- (ii) A 400 V, 750 rpm, 70 A DC shunt motor has an armature resistance of 0.3 ohm. When running under rated conditions, the motor is to be braked by plugging with armature current limited to 90 A. What external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300 rpm. Neglect saturation. (8)

Or

- (b) (i) Draw and explain the operation of three point starter with stepping arrangement for DC motors. (8)
- (ii) A starter required for a 220-V shunt motor. The maximum allowable current is 55A and the minimum current is about 35A. Find the number of starter resistance required and the resistance of each section. The armature resistance of the motor is 0.4 ohm. (8)

14. (a) Explain the different types of reduced voltage starting of induction motor. (16)

Or

- (b) Explain the multi quadrant operation of chopper and methods of controlling a chopper with neat sketch. (16)

15. (a) Explain the different types of speed control applicable for DC series motor. (16)

Or

- (b) Explain pole changing method and frequency changing method of speed control of induction motor. (16)