Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 71767

B.E/B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third Semester

Mechanical Engineering

EE 6351 — ELECTRICAL DRIVES AND CONTROLS

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

(Regulations 2013)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What are the factors that influence the choice of electric drives?

2.   Define heating time constant and cooling time constant.

3.   List the types of single phase induction motor.

4.   Draw the mechanical characteristics of shunt and series motor.

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

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

7.   Why chopper based dc drives give better performance than rectifier controlled
     drives?

8.   List the limitations of field control method.

9.   What are the advantages of slip power recovery scheme of controlling the speed
     of induction motor?

10. What is meant by V/f control?

11. (a) Draw and explain how to classify the drives according to their duty cycle 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 torque slip and speed torque characteristics of three phase induction motor. (13)

Or

(b) What are the different electrical braking methods used in electrical drives? Explain the methods applied to dc shunt motor. (13)

13. (a) With neat diagram, explain any three types of AC starters. (13)

Or

(b) What is the necessity of DC starters? Explain with neat sketches, the principle of operation of 3 point starter. (13)

14. (a) (i) Explain the Ward-Leonard system for speed control of dc motors. State the advantages and disadvantages of the system. (8)

(ii) Explain the Flux control method of speed control for dc shunt motor. (5)

Or

(b) Describe the working of step down dc chopper, with the help of suitable circuit diagram and waveforms. State the relation between output and input voltages. How the speed of a dc motor is controlled using a step down chopper? (13)

15. (a) Explain with neat sketch the conventional Kramer and Scherbius method of variable speed drive system used for slip power recovery scheme. (13)

Or

(b) Discuss the salient aspects of speed control scheme for ac voltage controller fed three phase induction motor. (13)

16. (a) A starter required for a 220 V shunt motor. The maximum allowable current is 55 A and the minimum current is about 35 A. Find the number of starter resistance required and the resistance of each section. The armature resistance of the motor is 0.4 ohm. (15)

Or

(b) Explain the different types of braking of three phase induction motors. (15)