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Question Paper Code : 31561

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Third Semester

Mechanical Engineering

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

(Common to Production Engineering, Chemical Engineering, Petrochemical Engineering and Petrochemical Technology)

(Regulation 2008/2010)

(Also common to PTME 2205 Electrical Drives and Control for B.E. (Part–Time) Third Semester – Production Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the block diagram of an electrical drive.
2. Give the examples where continuous duty at constant load is required.
3. Draw the mechanical characteristic of a three phase induction motor.
4. What are the methods of braking of electric motors?
5. Draw the basic automatic starter arrangement for shunt motor starting.
6. What are the two types of rotors of three phase induction motors?
7. Why is armature voltage control used below rated speed?
8. Draw the basic circuit for chopper controlled separately excited dc motor drive.
9. Name the power modulators (converters) used for V/f control of three phase induction motor.
10. State the applications where stator voltage control is employed for three phase induction motors.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the thermal model of an electric motor for (16)

(i) heating the electric motor when starting from cold

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

Or

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

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. (10)

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

12. (a) Explain the modifications to the speed-torque characteristics of a dc shunt motor for the following :

(i) with increase in armature resistance (8)

(ii) by field weakening. (8)

Or

(b) A 220 V dc series motor runs at 1200 rpm (clockwise) and takes an armature current of 80 A when driving a load with constant torque. Armature resistance is 0.05 Ω and field resistance is 0.05 Ω. Find the magnitude and direction of motor speed and armature current if the motor terminal voltage is reversed and the number of turns in field winding is reduced to 80%. Assume linear magnetic circuit. (16)

13. (a) A starter is required for a 220 V shunt motor. The maximum and minimum range of current values are 50 A and 30 A respectively. Find the number of sections of starter resistance required and the resistance of each section. The armature resistance of the motor is 0.5 Ω. (16)

Or

(b) Explain the different starting methods for three phase squirrel cage induction motor. (16)

14. (a) Explain the operation of single phase full converter fed separately excited dc motor drive. (16)

Or

(b) With neat circuit diagrams, explain chopper fed four quadrant dc drive. (16)

15. (a) Explain the static Scherbius drive which provides speeds below and above synchronous speed. (16)

Or

(b) Explain the constant torque mode and constant power mode of operation of voltage source inverter fed induction motor drive with necessary diagrams. (16)

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