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Question Paper Code : 40485

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

Third Semester

Mechanical Engineering

EE 8353 — ELECTRICAL DRIVES AND CONTROLS

(Common to Manufacturing Engineering/Mechanical and
Automation Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

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PART A — (10 × 2 = 20 marks)

1. Draw the arrangement of a typical electric drive.
2. Define heating time constant.
3. Compare mechanical braking with electric braking.
4. Sketch the speed - torque characteristics of three phase induction motor for different rotor resistances.
5. Why the starting current of DC motor is always high?
6. Draw the control circuit to control the field of DC series motor.
7. List the factors affecting the speed of DC motor.
8. Write the advantages of Ward-Leonard control scheme.
9. What you mean by slip power?
10. Draw the speed - torque characteristics of voltage controller fed induction motor drive.

PART B — (5 × 13 = 65 marks)

11. (a) List and explain the factors influencing the choice of an electrical drive. (13)

Or

- (b) (i) Elucidate the various classes of duty of an electric drive. (8)
- (ii) A motor operates on a periodic duty cycle in which it is clutched to its load for 10 min and declutched to run on no-load for 20 min. Minimum temperature rise is 40°C. Heating and cooling time constants are equal and have a value of 60 min. When load is declutched continuously the temperature rise is 15° C.

Determine :

- (1) Maximum temperature during the duty cycle; and
- (2) Temperature when the load is clutched continuously. (5)
12. (a) (i) Draw and explain the electrical and mechanical characteristics of DC series and DC shunt motor after during the torque equation. (8)
- (ii) Write a short note on regenerative braking in DC motor. (5)

Or

- (b) Explain all the braking methods suitable for three phase induction motor. (13)
13. (a) Describe the working of two point and three point starters with neat sketches. (13)

Or

- (b) Explain the working of star-delta starter and rotor resistance starter. (13)
14. (a) Explain the following speed control techniques suitable for DC motor.
- (i) Armature control (8)
- (ii) Field control (5)

Or

- (b) Describe the working of single phase fully controlled converter fed DC drive. (13)

15. (a) Explain the working of $\left(\frac{V}{f}\right)$ control scheme of induction motor with necessary control arrangement. (13)

Or

- (b) Elucidate with neat circuit diagram, how slip power is recovered from the induction motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Describe the working principle of AC voltage controller fed induction motor with relevant control circuit and waveforms. (15)

Or

- (b) With neat circuit diagram and waveforms, explain the working of four quadrant chopper fed DC drive. (15)
