Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 30582

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Sixth Semester

Electrical and Electronics Engineering

EE 8601 — SOLID STATE DRIVES

(Regulations 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State how higher load affects torque characteristic in DC drives.
2. What are all the conditions to be satisfied for the regenerative braking operation to take place?
3. What causes poor input power factor in phase controlled dc drives?
4. List the advantages in operating choppers at high Frequency?
5. How is the resistance in the output terminals of a chopper varied in rotor resistance control?
6. Compare slip power recovery scheme with rotor resistance control.
7. What are the causes of harmonic currents in static Kramer drive?
8. Why damper winding is not needed in self controlled Synchronous motors?
9. What is current feedback?
10. List the factors involved in converter selection.

PART B — (5 × 13 = 65 marks)

11. (a) Summarize the factors governing the selection of electric Drives for any variable speed application.

Or

(b) Analyze the multi quadrant dynamics of any suitable Electrical drive in the speed-torque plane.

12. (a) Explain the operation of chopper controlled dc series motor for motoring and braking with circuit diagrams and waveforms

Or

(b) Describe the steady state analysis of the single phase fully Controlled converter fed separately excited DC motor drive for continuous and discontinuous conduction mode.

13. (a) Explain the of operation constant V/f control of induction motor and draw the waveforms.

Or

(b) Explain the closed loop control scheme of an induction motor?

14. (a) Explain the operation of a 'power factor control' based self – controlled synchronous motor drive.

Or

(b) Explain the constant marginal angle control technique of self controlled synchronous motor drive employing load commutated thyristor inverter.

15. (a) Derive the transfer function of DC motor load system with armature voltage control.

Or

(b) Explain in detail design of current controller of closed loop speed control system of DC separately excited motor.

PART C — (1 × 15 = 15 marks)

16. (a) A 230 V, 960 rpm and 200 A separately excited dc motor has an armature resistance of 0.02W. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230 V. Assuming continuous conduction, Calculate

(i) Duty cycle ratio of chopper for motoring operations at 350 rpm. (5)

(ii) Duty cycle ratio of chopper for braking operation at rated torque and 350 rpm. (5)

(iii) If maximum duty ratio of chopper is limited to 0.95 and maximium permissible motor current is twice the rated. Calculate the maximum permissible motor speed and power fed to the source. (5)

Or

(b) A three phase 50Hz Induction motor has the following Parameters for its equivalent circuit R1 = R4 = 0.04 ohm and X1 = X4 = 0.1 ohm is to be operated at one half of its rated voltage and 45 Hz frequency. Calculate

(i) The maximum torque at this reduced voltage and frequency operation in terms of its normal value and (8)

(ii) The starting torque at this reduced frequency and the voltage in terms of its normal value. (7)