

Reg. No. :

Question Paper Code : 52923

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Sixth Semester

Robotics and Automation Engineering

EC 6653 — POWER ELECTRONICS AND DRIVES

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define holding current in SCR.
2. What do you mean by snubber circuit?
3. List the effect of source inductance in the performance of a converter.
4. Compare AC regulator with conventional transformer.
5. Name the functions of feedback diode and freewheeling diode.
6. Define duty ratio in chopper.
7. Sketch the mechanical and electrical characteristics of DC shunt motor.
8. List the advantages of closed loop control of any drive system.
9. Give the limitations of voltage controller fed induction motor drive.
10. Define step angle in stepper motor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the working of TRIAC in the different modes of operation and also draw the I – V characteristics. (8)
- (ii) Why the SCR is not turned off, even after removing the gate pulses? Explain this with the help of Two Transistor analogy. (5)

Or

- (b) Explain the basic structure and working of IGBT and also explain I – V characteristics and switching characteristics. (13)

12. (a) (i) With neat circuit diagram, explain the working of single phase full converter with large inductive load and also derive the expression for the average output voltage. Show the variation of average output voltage against firing angle. (8)
- (ii) Derive the performance parameter of single phase half controlled converter. (5)

Or

- (b) Explain the working of six pulse converter with neat circuit diagram in discontinuous mode and continuous mode. (13)
13. (a) (i) Enumerate the construction and working of three phase bridge inverter with 180° mode of operation. Also, plot the line and phase voltage waveform for the same. (8)
- (ii) What is switching mode regulator? Describe the working of buck-boost converter with neat circuit diagram. (5)

Or

- (b) Write a detailed technical note on the following:
- (i) Selection of drives. (8)
- (ii) Uninterrupted power supplies (5)
14. (a) (i) Explain the multi-quadrant operation of Electric Drive in Speed – Torque plane. (8)
- (ii) Explain the working of fully controlled converter fed DC Drive with neat circuit arrangement. (5)

Or

- (b) Describe the working of four quadrant chopper with neat circuit diagram and waveforms. (13)
15. (a) Explain the working of induction motor drive with variable voltage and fixed frequency. Also explain the working of induction motor drive with fixed voltage and variable frequency. Compare Torque-Slip characteristics of the same. (13)

Or

- (b) A 3-phase, 400V, 6 pole, 50 Hz, delta-connected, slip-ring induction motor has rotor resistance of 0.2Ω and leakage reactance of 1Ω per phase referred to stator. When driving a fan load it runs at full load at 4% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 850 rpm. Neglect stator impedance and magnetization branch. Stator to rotor turns ratio is 2.2.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Explain the technical concept of DC drive analogy and also compare scalar and vector control. (8)
- (ii) Draw and explain any one control circuit suitable for stepper motor. (7)

Or

- (b) Write the significance of (v/f) ratio. Discuss the working of (v/f) ratio based induction motor drive with neat circuit diagram. Also explain the drive operating regions. (15)