

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SIXTH SEMESTER B.TECH DEGREE EXAMINATION (R,S), MAY 2024
ROBOTICS AND AUTOMATION****(2020 SCHEME)****Course Code : 20RBT304****Course Name: Electric Drives and Control****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Draw and explain the speed torque characteristics of DC Series motor with suitable equations.
2. A 500V DC Shunt motor with constant field drives a load whose load torque is proportional to the square of the speed. when running at 900 rpm it takes an armature current of 45A. Find the speed at which the motor runs if a resistance of 8Ω is connected in series with the armature. The armature resistance may be taken as 1Ω .
3. Compare BJT and Power MOSFET.
4. What is meant by commutation of SCR? Explain natural and forced commutation.
5. A 120 V battery supplies RL load through a chopper. A freewheeling diode is connected across RL load having $R=5\Omega$ and $L=60$ mH. Load current varies between 7A and 9A. Calculate time ratio T_{on}/T_{off} for this chopper.
6. What is meant by Regenerative braking control?
7. Compare methods to control output voltage of an inverter.
8. A three-phase inverter is fed from 600 V source. For a star connected load of 15Ω per phase, determine the rms load current for 120° conduction mode.
9. List the major components of a typical servo system.
10. Compare BLDC motor with Conventional DC motor.

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. With suitable block diagram explain the essential parts of electric drive. Mention the unique features of an electric drive. (14)

OR

12. Explain the necessity of starter in electric motors. With neat diagram explain the starting method of DC shunt motor. (14)

MODULE II

13. Explain in detail the switching characteristics of an IGBT. (14)

OR

14. Explain the different types of triggering circuits that can be used to trigger an SCR. (14)

MODULE III

15. Explain the working of a single-phase full wave bridge rectifier with RLE load. (14)

OR

16. Explain the operation of a four quadrant DC chopper drive. (14)

MODULE IV

17. With necessary diagrams and equations, explain the working of three-phase bridge inverter with R load operating in 180° conduction mode. (14)

OR

18. What is the need for controlling the voltage at the output terminals of an inverter? Describe briefly the various methods employed for the control of output voltage of inverters. (14)

MODULE V

19. Explain the open loop and closed loop control of stepper motor with necessary diagrams. (14)

OR

20. With a neat block diagram explain the microcontroller based PMSM drive. (14)
