

Enroll No

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
 (An Empowered Autonomous Institute, Affiliated to SUK)
 End Semester Examination (Nov./Dec. 2025)
 T.Y.B.Tech. Robotics & Automation V

Q.P.Code
E 1138

Course Code: RA301

Course Name: Electric Drives and Control

Day & Date: Wednesday 05/11/2025

Time : 10:30 To 1:30

Max Marks: 100

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas, figures in the first right column indicate total marks for that whole question.
 - 3) CO is the index number of the Course Outcome statement.
 - 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
 - 5) Assume suitable data if necessary.
 - 6) Use of non-programmable calculators is allowed

Q.1

	Marks	COs	BT Level
(a) Explain the basic principles of DC motors (4 Marks). How does the interaction between magnetic field and current produce motion? (3 Marks).	07	CO1	4

OR

(a) Explain following:	7	CO1	3
i. Types of Electrical Drives (4 Marks).			
ii. Advantages of Electric Drives (3 Marks).			
(b) Describe the role of power electronic converters in electric drive systems (5 Marks). How do they contribute to the performance and control of motors? (3 Marks).	8	CO1	3

Q.2

(a) Draw the V-I Characteristics of a PN junction diode (2 Marks) and explain the working in following condition.	8	CO2	3
i. Forward bias (3 Marks).			
ii. Reverse bias (3 marks).			
(b) Differentiate between MOSFETs and IGBTs in terms of construction, operation, and applications.	7	CO2	4
OR			
(b) Explain the V/f (Voltage-to-Frequency) control method for AC motors (4 Marks). How does it help maintain torque while varying motor speed? (3 Marks).	7	CO2	4

Q.3

(a) Explain following speed control methods of dc series motor with the help of suitable diagram.	9	CO3	4
i. Armature Diverter Method (3 Marks)			
ii. Field Diverter Method (3 Marks)			
iii. Armature Resistance Control Method (3 Marks)			



	(b) A 250 V DC shunt motor having an armature resistance of 0.5Ω carries an armature current of 50 A and runs at 700 RPM. If the flux is decrease by 12 % by the field rheostat. Find the speed of the motor assuming the load torque remains the same.	6	CO3	4
	OR			
	(b) Compare the construction and working of series, shunt, and compound DC motors (2 marks each)	6	CO3	4
Q.4	(a) Explain working principle (4 marks) of synchronous motor with help of suitable diagram (3 marks)	7	CO4	3
	(b) Explain following in context of 3 Phase Induction Motor	8	CO4	4
	i. How rotating magnetic fields are created (4 marks)			
	ii. Why induction motor never runs in synchronous speed (4 marks)			
Q.5	(a) Explain the basic structure of a digital control system (4 Marks). How do discrete-time systems differ from continuous-time systems in terms of signal processing and control? (3 Marks)	7	CO5	4
	(b) Describe the working of Sinusoidal Pulse Width Modulation (SPWM) (4 Marks). How does it improve the performance of inverter-fed motor drives? (3 Marks)	7	CO5	4
	(c) What are the key advantages of using Space Vector PWM (SVPWM) over traditional sinusoidal PWM? (4 Marks). Support your answer with a simple diagram. (2 Marks)	6	CO5	3
	OR			
	(c) Explain the role of sampling time and quantization in digital control systems (3 Marks). How do they affect system performance? (3 Marks)	6	CO5	3
Q.6	(a) Present a case study of an industrial robotic system (4 Marks). Discuss how electrical drives contribute to its performance, reliability, and precision.(3 Marks)	7	CO6	5
	(b) Discuss the motion control requirements in an automated pick-and-place robotic system (4 Marks). Explain how velocity and position control loops are implemented. (3 Marks)	7	CO6	2
	(c) Write short notes on PLC-based control of robotic drives (2 Marks), highlighting advantages (2 Marks) and real-world applications (2 Marks).	6	CO6	3
	OR			
	(c) Discuss the role of PLC programming in coordinating drive systems for multi-axis robotic arms in an automated production environment.	6	CO6	3

