BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : V**
BRANCH: MECHANICAL **SESSION : MO/2025**

SUBJECT: ME377 MECHATRONICS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Explain any three basic elements of a measurement system? How does it integrate mechanical, electrical, and computer engineering principles to create intelligent systems?	[5]		2
Q.1(b)	Describe the design process of a mechatronic product, from concept to implementation, using an example such as an automatic door system or robotic arm. How are Microsensors fabricated . Explain the process.	[5]		2
Q.2(a)	What is a Karnaugh Map (K-Map)? Explain its purpose in digital logic design. Draw a 2-variable K-Map and simplify the Boolean expression F(A,B) = A'B + AB' + AB.	[5]		2
Q.2(b)	Explain the meaning of resolution and quantization in ADCs. Explain the working principle of a Successive Approximation ADC (SAR ADC) with a block diagram and explanation.	[5]		2
Q.3(a)	Explain Hysterisis Error, Accuracy, Sensitivity, Repeatability and Resolution	[5]		2
Q.3(b)	Explain how a thermocouple generates an emf based on the Seebeck effect. A platinum RTD has a resistance of 100 Ω at 0°C and 138.5 Ω at 100°C. Find its temperature coefficient of resistance (α).	[5]		2
Q.4(a)	What is an actuator? Explain its role in a mechatronic system.Explain Stepper Motor	[5]		2
Q.4(b)	A stepper motor has a step angle = 3.6°. (1) How many pulses are required for the motor to rotate through ten complete revolutions? (2) What pulse frequency is required for the motor to rotate at a speed of 100 rev/min	[5]		2
Q.5(a)	Explain one Rapid Prototyping process with proper figure .	[5]		4
Q.5(b)	What are Programmable Logic Controllers ? Explain with proper figure.Devise a circuit that can be used to start a motor and then after a delay of 80 seconds start a pump. When the motor is switched off there should be adelay of 10 seconds before the pump is switched off .	[5]		4

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