


VIT

Vellore Institute of Technology

Final Assessment Test – November 2025

Course: BMEE210L - Mechatronics and Measurement Systems

Class NBR(s): 2164 / 2165 / 2166 / 2167 / 2168

Slot: C1+TC1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

COs	CO Statements
CO1	Demonstrate the basic concepts, applications and elements of mechatronic systems.
CO2	Analyze various measuring instruments for different applications.
CO3	Compare various types of sensors and actuators used in mechatronics systems.
CO4	Apply the concept of signal processing and use of interfacing systems.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

 Answer ALL Questions

(10 X 10 = 100 Marks)

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| 1. | Describe the mechatronics system design approach. Illustrate with a flowchart. | CO1 | BL2 |
| 2. | Explain the role of sensing elements, actuators and measurement units in a mechatronics system with an example product. | CO1 | BL2 |
| 3. | Explain how proximity sensors and switches can be integrated into a robotic gripper for object detection. Draw a schematic showing sensor placement and signal flow. | CO2 | BL2 |
| 4. | Compare the use of single-element strain gauges and rosette strain gauges for measuring multi-axial stress states. Which is better for aircraft wing testing? Justify with a diagram of a strain gauge rosette. | CO2 | BL3 |
| 5. | Design a temperature monitoring system for a cold storage unit using a bimetallic strip and an electrical resistance thermometer, including sensor placement, signal conditioning, and control logic. Draw a block diagram of your system. | CO3 | BL4 |
| 6. | With a schematic, explain the sensing principle of an inertial measurement unit and elaborate the functions of each component. | CO3 | BL2 |
| 7. | Draw a diagram of a solenoid and explain its working principle and analyze the magnetic field strength in a solenoid that depends on the number of turns and current. | CO3 | BL3 |
| 8. | Design a hydraulic circuit for controlling the movement of a press machine with a circuit diagram and explain the force and speed control strategies. | CO3 | BL2 |

- 9.a) Explain the signal conversion methods for interfacing transducers and actuators with a data acquisition and control system. CO4 BL3

OR

- 9.b) Design an intelligent multivariable measurement system for monitoring temperature, pressure, and flow in a chemical plant with a block diagram. CO4 BL3
- 10.a) Evaluate any two methods of taper measurement for the component shown in figure 1. Justify the method that provides higher accuracy. CO2 BL2



Figure 1 (Tool Holder)

OR

- 10.b) Explain how a profile projector can be used for measuring screw thread pitch and gear profiles with a labeled diagram of a profile projector. CO2 BL2

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