Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

ME3EM05 Sensors & Actuators

Programme: B.Tech. Branch/Specialisation: ME

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which of the following sensor can be used for linear displacement measurement? **1**

(a) LVDT (b) Potentiometer

(c) Both (a) and (b) (d) None of these

ii. Signal conditioning for sensors involves- **1**

(a) Amplification (b) Filtering

(c) Both (a) and (b) (d) None of these

iii. Which of the following is a vacuum measurement gauge? **1**

(a) McLeod Gauge (b) Pirani Gauge

(c) Ionization Gauge (d) All of these

iv. Which of the following is not a pressure sensing element? **1**

(a) Bellows (b) Bourdon Tube

(c) Orifice Plate (d) Diaphragm

v. Which of the following is not a temperature transducer? **1**

(a) Thermocouple (b) RTD

(c) Thermistor (d) LVDT

vi. In a steel bulb thermometer, which liquid can be used for measuring temperature up to 6000^0C? **1**

(a) Mercury (b) Ether (c) Water (d) None of these

vii. The rate at which fluid flows through a closed pipe can be determined by- **1**

(a) Determining the mass flow rate

(b) Determining the volume flow rate

(c) Both (a) and (b)

(d) None of these

P.T.O.

viii. The devices used for flow obstruction is/are- **1**
(a) Orifice plate
(b) Venturi tube
(c) Flow nozzle
(d) All of these

ix. Hydraulic system is- **1**
(a) Less precise than pneumatic system
(b) More precise than pneumatic system
(c) They are comparable in precision
(d) None of these

x. If no load is attached to piston rod the movement of piston assembly is possible when- **1**
(a) Oil overcomes its self-weight
(b) Oil overcomes friction in the piston rod assembly
(c) Both (a) and (b)
(d) None of these

Q.2 i. Define sensors with examples. **2**

ii. Describe the term signal conditioning circuit with its necessary components. **3**

iii. Describe strain gauge with its principle of operation, formula of gauge factor and signal conditioning circuit. **5**

OR iv. Discuss LVDT with its principle of operation, schematic diagram and advantages. **5**

Q.3 i. What is difference between force and torque? **2**

ii. Explain Bourdon tube in detail with principle of operation, schematic diagram, related formulas and applications. **8**

OR iii. Explain the principle of operations with appropriate diagram for any two gauges used for vacuum measurement. **8**

Q.4 i. Discuss LM-35 IC temperature sensor in details. **3**

ii. Write principles of operation of thermocouple, RTD and thermistor as temperature sensors in brief. **7**

OR iii. Explain capacitive level sensors in detail with principle of operation, signal conditioning circuit advantages and limitations. **7**

Q.5 i. Describe the difference between turbulent and laminar flow. **3**

ii. Explain obstruction flow meters with principle of operation different types and applications. **7**

OR iii. Describe the principle of operation of electromagnetic flow meter, turbine flow meter and ultrasonic flow meter. **7**

Q.6 Attempt any two:

i. Compare and contrast pneumatic and hydraulic actuators. **5**

ii. Write a short note on variable speed drives **5**

iii. Describe control valves based on their types and functions **5**

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Marking Scheme
ME3EM05 Sensors and Actuator

Q.1	i)	(c) Both	**1**
	ii)	(c) Both	**1**
	iii)	(d) All of these	**1**
	iv)	(c) Orifice Plate	**1**
	v)	(d) LVDT	**1**
	vi)	(a)Mercury	**1**
	vii)	(c) Either (a) or (b)	**1**
	viii)	(d) All of these	**1**
	ix)	(b) More precise than pneumatic system	**1**
	x)	(c) Both (a) and (b)	**1**
Q.2	i.	Definition 1 mark example 1 mark	**2**
	ii.	Description 1.5 marks components 1.5 marks	**3**
	iii.	Principle 2 marks, formula 1 mark signal conditioning circuit 2 marks	**5**
OR	iv.	Principle of operation 2 marks, schematic 2 marks, advantages 1 mark	**5**
Q.3	i.	Difference description 2 marks	**2**
	ii.	principle of operation 2, schematic diagram 2, related formulas 2 and applications 2	**8**
OR	iii.	Diagram each 2 marks principle of operation each 2 marks	**8**
Q.4	i.	1 mark for each correct principle of operation	**3**
	ii.	Definition and description 3 marks, features 2 marks, interfacing 2 marks	**7**
OR	iii.	Principle of operation 2 signal conditioning 2 advantage 1 limitation 1	**7**
Q.5	i.	Difference explained properly 3 marks	**3**
	ii.	Principle 2 marks types 3 marks applications 2 marks	**7**
OR	iii.	electromagnetic flow meter 3, turbine flow meter 2 and ultrasonic flow meter 2	
Q.6	i.	Qualitative marking based on answer	**5**
	ii.	Qualitative marking based on answer	**5**
	iii.	Qualitative marking based on answer	**5**

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