

Enrollment No.....



Faculty of Engineering

End Sem Examination Dec-2023

ME3CO21 Sensors &amp; Control

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. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. What is the accuracy of an instrument? **1**  
 (a) The smallest value that can be measured by the instrument  
 (b) The difference between the maximum and minimum values that can be measured by the instrument  
 (c) The time taken by the instrument to respond to a change in the input signal  
 (d) The degree of closeness of the measured value to the true value of the signal
- ii. A linear transfer function is also called as \_\_\_\_\_. **1**  
 (a) System transfer function (b) Component transfer function  
 (c) Constant transfer function (d) Both (a) and (c)
- iii. IR sensor operates in \_\_\_\_\_ range. **1**  
 (a) 0.7 micro-meters to 1000 micrometers  
 (b) 0.5 micro-meters to 1000 micrometers  
 (c) 0.7 micro-meters to 100 micrometers  
 (d) 0.7 micro-meters to 10 micrometers
- iv. A sensor that detects the presence of an object without any contact is called \_\_\_\_\_ sensor. **1**  
 (a) Temperature (b) Light (c) IR (d) Proximity
- v. LDR sensor is abbreviated as \_\_\_\_\_. **1**  
 (a) Light Dependent Resistor (b) Light Determinant Resistor  
 (c) Luminous Duplicated Resistor (d) None of these
- vi. Which of the following are the examples of temperature sensors? **1**  
 (a) Bimetallic devices (b) Thermometers  
 (c) Silicon diode (d) All of these

- [2]
- vii. A control system in which the control action is somehow dependent on the output is known as \_\_\_\_\_. **1**  
 (a) Closed loop system (b) Semi-closed loop system  
 (c) Open system (d) None of these
- viii. Op-Amp has \_\_\_\_\_ input type configuration. **1**  
 (a) 2 (b) 3 (c) 4 (d) 5
- ix. \_\_\_\_\_ sensors produce digital output that can be directly interfaced with the digital controller. **1**  
 (a) Digital (b) Analog (c) Both (a) and (b) (d) None of these
- x. The control logic in a programmable logic controller can be programmed by \_\_\_\_\_. **1**  
 (a) FBD logic (b) Sequential logic  
 (c) Structured text (d) All of these
- Q.2 i. Write any four differences between sensors & transducers. **4**  
 ii. Draw & explain the block diagram of open loop control system. Also derive its transfer function. **6**
- OR iii. What are dynamic measurements? Define (a) Speed of response and response time, (b) Time lag, (c) Fidelity and (d) Dynamic error. **6**
- Q.3 i. Describe the working principle of strain gauge. **4**  
 ii. What is LVDT? Explain its working using a suitable circuit diagram. **6**
- OR iii. Give the comparison of position, velocity and acceleration sensors. **6**
- Q.4 i. How acoustic sensor works? **3**  
 ii. Give the names of the different sensors used in home automation. Explain any three of them in brief. **7**
- OR iii. Write a short note on the following automobile sensors: **7**  
 (a) Airflow sensor (b) Throttle position sensor
- Q.5 i. Draw the symbol of Op-amp & explain its each terminal. **3**  
 ii. Derive the expression of integrator circuit using Op-amp. Also draw its circuit diagram. **7**
- OR iii. Describe the different characteristics of an ideal Op-amp. **7**
- Q.6 i. What is PLC? Write any two advantages of PLC over relay system. **3**  
 ii. What is controller? Define its each type with an example. **7**
- OR iii. What are the advantages and disadvantages of microcomputer-based drives? Also write the applications of microcomputer-based drives. **7**

\*\*\*\*\*

**Marking Scheme****ME3CO21 (T)- Sensors And Control**

Q.1	i)	What is the accuracy of an instrument?	1
	d)	The degree of closeness of the measured value to the true value of the signal.	
	ii)	A linear transfer function is also called as _____. d) Both a and c	1
	iii)	IR sensor operates in _____ range. a) 0.7 micro-meters to 1000 micrometers	1
	iv)	A sensor that detects the presence of an object without any contact is called _____ sensor. d) Proximity	1
	v)	LDR sensor is abbreviated as _____. a) Light Dependent Resistor	1
	vi)	Which of the following are the examples of temperature sensors? d) All the above	1
	vii)	A control system in which the control action is somehow dependent on the output is known as- a) Closed loop system	1
	viii)	Op-Amp has _____ input type configuration. a) 2	1
	ix)	_____ sensors produce digital output that can be directly interfaced with the digital controller a) Digital	1
Q.2	x)	The control logic in a programmable logic controller can be programmed by _____ d) All of the above	1
Q.2	i.	Four differences	(1 Mark for each) 4
	ii.	Block diagram	1 Mark 6
		Explanation	2 Marks
		Derivation for transfer function	3 Marks
OR	iii.	What are dynamic measurements?	2 Marks 6
		Define:	
	(i)	Speed of response and Response time	1 Mark
	(ii)	Time Lag	1 Mark
	(iii)	Fidelity	1 Mark
	(iv)	Dynamic error	1 Mark

Q.3	i.	Description of strain gauge	1 Mark	4
		Working principle of strain gauge	2 Marks	
		Formula	1 Mark	
	ii.	What is LVDT?	1 Mark	
OR		Working	3 Marks	6
		Circuit diagram	2 Marks	
	iii.	Give the comparison of position, velocity and acceleration sensors. (1.5 Mark for each x 4 = 6 Marks)		
Q.4	i.	Acoustic sensor working	3 Marks	3
		01 define .		
		02Working		
	ii.	Give the names of the different sensors used in home automation.	7	
OR		Explain any three of them in brief.	1 Mark	7
		(2 Mark for each x 3 = 6 Marks)		
	iii.	Write a short note on the following automobile sensors: (i) Airflow sensor (ii) Throttle position sensor. (3.5 Mark for each)		
Q.5	i.	Draw the symbol of Op-amp	1 Mark	3
		Explain its each terminal	2 Mark	
	ii.	Derive the expression of integrator circuit using Op-amp.	7	
		Also draw its circuit diagram.	5 Mark	
OR		Describe the different characteristics of an ideal op-amp.	2 Mark	7
	iii.			
		(1 Mark for each x 7 = 7 Marks)		
Q.6	i.	What is PLC?	1 Mark	3
		Write any two advantages of PLC over relay system.		
			2 Mark for each	
	ii.	What is controller?	1 Mark	
OR		Define its each type with an example.		7
		(2 Mark for each x 3 = 6 Marks)		
	iii.	What are the advantages and disadvantages of microcomputer-based drives?	(3 Mark for each) (3 Mark for each)	
		Also write the applications of microcomputer-based drives.		
		(0.5 Mark for each x 2 = 1 Mark)		

[2]  
\*\*\*\*\*

[3]