Enrollment No..................................

Faculty of Engineering

End Sem Examination Dec 2024

AU3CO53 Sensors & Control

Programme: B.Tech.   Branch/Specialisation: AU

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.

			Marks	BL	PO	CO	PSO
Q.1	i.	The error detector element in a control system gives-	1	1	1	1	1

(a) The sum of the reference signal and feedback signal
(b) The sum of the reference signal and error signal
(c) The difference of the reference signal and feedback signal
(d) The difference of the reference signal and output signal

			Marks	BL	PO	CO	PSO
	ii.	The transfer function is defined as-	1	1	1	1	1

(a) The ratio of Laplace transform of output to Laplace transform of input considering initial condition as zero
(b) The ratio of Laplace transform of input to Laplace transform of input considering initial conditions as zero
(c) The ratio of input to output
(d) The ratio of output to input

			Marks	BL	PO	CO	PSO
	iii.	Liquid flow rate is measured using-	1	2	1	2	1

(a) A Pirani gauge
(b) A pyrometer
(c) An orifice plate
(d) A Bourdon tube

P.T.O.

Q.6		Attempt any two:					
	i.	Write the mathematical expression for PID controllers.	5	1	2	1	1
	ii.	Draw and explain the architecture of a PLC.	5	2	2	2	1
	iii.	Describe construction of a pneumatic relay.	5	2	1	2	1

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iv. In an L.V.D.T., the core is made up of a- **1** | 1 | 1 | 1 | 1
(a) Non-magnetic material
(b) A solid ferro-electric material
(c) High permeability, nickel-iron hydrogen annealed material in order to produce low harmonics, low null voltage and high sensitivity. The core is slotted to reduce eddy current losses
(d) All of these

v. Photo resists are exposed to which rays for transferring patterns? **1** | 2 | 1 | 2 | 1
(a) Cosmic rays   (b) UV rays
(c) IR rays   (d) None of these

vi. Which one of the following materials would be used for making an LDR? **1** | 2 | 1 | 2 | 1
(a) Lead Sulfide   (b) Pure Aluminum
(c) Iron Ore   (d) Aluminum Oxide

vii. Insertion of negative feedback in a control system affects: **1** | 2 | 2 | 2 | 1
(a) The transient response to vanish uniformly
(b) The transient response to decay very fast
(c) No change in transient response
(d) The transient response decays at a slow rate.

viii. Unit Impulse response of a system in Laplace transform form gives- **1** | 2 | 2 | 2 | 1
(a) Transfer function   (b) Unit step function
(c) System gain   (d) Unit ramp function

ix. Finite steady state error- **1** | 2 | 2 | 2 | 1
(a) Varies inversely with K
(b) Is independent of K
(c) Varies directly with K
(d) None of these

x. Pneumatic relay is an integral part of Pneumatic controller to: **1** | 2 | 2 | 2 | 1
(a) Increase gain   (b) Decrease gain
(c) Increase flow rate   (d) Decrease flow rate

Q.2 i. What is a transducer? Give an example. **2** | 2 | 1 | 2 | 1

ii. What is the purpose of a transfer function in control systems? **3** | 1 | 1,2 | 1 | 1

iii. Define a transducer and explain its role in control systems. **5** | 1 | 1 | 1 | 1

OR iv. Explain the difference between an open-loop system and a closed-loop system with examples. **5** | 1 | 1,2 | 1 | 2

Q.3 i. What are the types of proximity sensors? **2** | 2 | 2 | 2 | 1

ii. Discuss the application areas of inductive transducers. Also discuss basic working of LVDT. **8** | 2 | 1 | 2 | 1

OR iii. Derive an expression of Gauge Factor in a strain gauge, discussing its importance in the area of bridge balancing. **8** | 3 | 1,2 | 3 | 2

Q.4 i. What is the best way to detect randomly placed objects using an ultrasonic sensor? **3** | 2 | 2 | 2 | 1

ii. Explain the following potential divider methods for the measurement of RMS value of high voltages- **7** | 2 | 1,2 | 2 | 1
(a) Resistance potential divider
(b) Capacitive of potential divider

OR iii. Explain the working principle and applications of an LDR. **7** | 2 | 2 | 2 | 2

Q.5 i. What is a signal flow graph? How does it differ from a block diagram? **4** | 3 | 2 | 3 | 2

ii. In which manners does an error detector enhance a closed-loop system's performance? Give examples. **6** | 2 | 2 | 2 | 1

OR iii. Explain the steps involved in developing a mathematical representation of a physical system. Why is modelling important in control systems? **6** | 2 | 2 | 2 | 2

Q. (i) The error detector element in a Control system gives.

(C) (d) The difference of the referce signal and Feedback Signal. (1)

(ii) The transfer function is defined as - - - - (1)

(a) The ratio of Laplace transform of output to Laplace transform of input considering initial condition as zero

(iii) Liquid flow rate is measured using -

(c) An orifice Plate. - - - - - - - (1)

(iv) In an LVDT., The core is made up of a. (1)

(c) High Permeability, nickle-iron hydrogen annealed material. - - -

(v) Photo resists are exposed to which rays for (1) transferring Patterns?

(b) UV rays

(vi) which one of the following materials would be (1) used for making an LDR?

(a) Lead sulfide

(vii) Insertion of negative feedback in a Control system (1)

(b) The transient response to decay very fast

(viii) unit Impulse response of a system in Laplace transform from gives! (1)

(a) Transfer function

(ix) Finite steady state error -
(a) Varies inversely with K. _____ (1)

(x) Pheumatic relay is an integral part of Pheumatic controller to:
(c) Increase flow rate _____ (1)

Q. 2(i) what is transducer & Example (2)

Defination — (1)
Example — (1)

(ii) What is purpose of a transfer function (3)
Defination — (1)
Purpose of Transfer function - (2)

(iii) Define a transducer and explain its role
Defination - (2)
Its role in control system - (2)
Diagram — (1)

or (iv) Explain difference b/w open loop & close loop. (5)
Each of difference - (1) (1 × 5)

Q.3(i) types of Proximity sensors.
only Name of Proximity sensor — (2)

(ii) Discuss the appeication of trans. — (8)
appeication of inductive transducer - (3)
Diagram of LVDT — (2)
working principle of LVDT - (3)

or (iii) expression of Gauage Factor. — (8)
expression of gauge factor — (3)
Bridge balance method - (3)
Diagram - (2)

Q.-4(i) best way to detect randomly placed - (3)

    method of placed object using sensor - (1)

    Diagram & working - - (2)

Q. 4(ii) Explain the following - __ (7)

    (a) Resistance Potential divider 3.5

    (b) Capacitive of Potential divider - 3.5

(iii) working principle and application - (7)

    Diagram of LPR - (1)

    working principle - (3)
    application of LPR - (3)

Q-5(i) what in signal flow graph - (4)

    Defination - (2)
    Difference any two - (2)

    (ii) error detector enhances. - (6)

    error detector close loop system - (4)

    example - (2)

    (iii) mathematical respresendation - (6)

    Developing a mathematical respresent - (4)
    Importance - (2)

Q-6 Attempt any two.
    (i) mathematical expression derive - (3)
       & proof - (2)

    (ii) architecture of PLC - (3)
       explination - (2)

    (iii) construction of pneumatic delay - (3)
       Explination - (2)