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| Reg. No. | | | | | | | | | | | | | | | | | | | |
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| Question Paper Code | 14258 |
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Forth Semester

Mechanical Engineering

20MEPC401 - MEASUREMENT AND CONTROL SYSTEMS

Regulations - 2020

(Use of *semi log and polar graph* is permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

| | Marks | K- Level | CO |
|--|-------|-------------|-----|
| 1. Which one is a dynamic characteristic? (a) Resolution (b) Linearity (c) Hysteresis (d) Time constant | 1 | K1 | CO1 |
| 2. Which of the following is a static characteristic of a measurement system? (a) Response time (b) Accuracy (c) Rise time (d) Overshoot | 1 | K1 | CO1 |
| 3. A control system without feedback is called (a) Closed loop system (b) Adaptive system (c) Open loop system (d) Digital system | 1 | K1 | CO2 |
| 4. The DC servomotor is commonly used in (a) High-speed control systems (b) Low precision systems (c) Temperature systems (d) Domestic wiring | 1 | K1 | CO2 |
| 5. Which of the following is not a standard test input signal? (a) Step (b) Ramp (c) Parabolic (d) Sinusoidal noise | 1 | K1 | CO3 |
| 6. A plot that represents magnitude and phase in a single graph is (a) Polar plot (b) Histogram (c) Scatter plot (d) Step plot | 1 | K1 | CO3 |
| 7. Strain gauge is typically used for (a) Measuring temperature (b) Measuring force (c) Measuring frequency (d) Measuring color | 1 | K1 | CO4 |
| 8. Dynamometer is used to measure (a) Temperature (b) Torque (c) Voltage (d) Pressure | 1 | K1 | CO4 |
| 9. The sensing element in a filled system thermometer is usually (a) Liquid or gas filled bulb (b) Semiconductor (c) Magnet (d) Light sensor | 1 | K1 | CO5 |
| 10. Pressure below atmospheric is called (a) Gauge pressure (b) Absolute pressure (c) Vacuum pressure (d) Vapour pressure | 1 | K1 | CO5 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

| | | | |
|--|---|----|-----|
| 11. Enumerate the term calibration employed in instruments. | 2 | K2 | CO1 |
| 12. What do you mean by curve fitting? | 2 | K1 | CO1 |
| 13. Define open loop and closed loop system. | 2 | K1 | CO2 |
| 14. Write the Mason's gain formula. | 2 | K1 | CO2 |
| 15. Name the test signals used in control system. | 2 | K1 | CO3 |
| 16. List the time domain specifications. | 2 | K1 | CO3 |
| 17. The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant peak and resonant frequency. | 2 | K2 | CO4 |
| 18. Define step signal. | 2 | K1 | CO4 |
| 19. Compare In line rotating and In line stationary torque measurement. | 2 | K2 | CO5 |
| 20. What are the types of accelerometers? | 2 | K1 | CO5 |
| 21. What are the classifications of tachometer? | 2 | K1 | CO5 |
| 22. Define atmospheric pressure and absolute pressure. | 2 | K1 | CO2 |

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) What are the different types of errors? Explain how to eliminate errors in instruments. 11 K2 CO1

OR

- b) Explain the functional blocks of a measurement system with a neat diagram. 11 K2 CO1

24. a) Apply the concepts to real-world applications with examples of open-loop and closed-loop systems. 11 K3 CO2

OR

- b) 11 K3 CO2

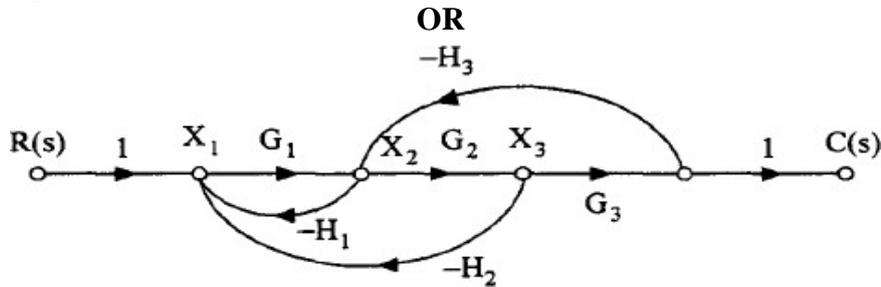


Figure 1

For the signal flow graph in Figure 1, Find $\frac{C(S)}{R(S)}$ using Mason's gain formula.

25. a) Derive the expression and draw the response of second order system for undamped case with unit step input. 11 K3 CO3

OR

- b) The response of a servomechanism is $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$ when subject to a unit step input. Obtain an expression for closed loop transfer function. Determine the undamped natural frequency and damping ratio. 11 K3 CO3

26. a) The open loop transfer function of a unity feedback system is given by $G(s) = 1/s(1+s)^2$. Sketch the polar plot and determine the gain margin and phase margin. 11 K3 CO4

OR

- b) Sketch the bode plot for the unity feedback control system with the given transfer function and determine phase margin and gain margin 11 K3 CO4

$$G(S) = \frac{75(1+0.2S)}{s(s^2 + 16s + 100)}$$

27. a) With a neat diagram, explain the principle and construction details of linear and circular potentiometer. 11 K2 CO5

OR

- b) Discuss in detail the pneumatic load cell for force measurement with a neat sketch. 11 K2 CO5

28. a) Discuss the total radiation type pyrometer for temperature measurement with a neat sketch. 11 K2 CO6

OR

- b) Explain how McLeod gauge used for low pressure measurement. 11 K2 CO6