

Indian Maritime University
(A Central University, Govt. of India)
Supplementary Examinations – March / April 2024
Programme Name: B Tech (ME)
Semester: III
Subject Code: UG11T4301
Subject Name: Basic Control Engineering

Date: 06.04.2024

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

(10X1=10 Marks)

Answer All Questions

1. Laplace Transform of Unit Step Function is;

- (a) 1
- (b) s
- (c) 1/s
- (d) 1/s²

2. Which among the following is a Pressure sensor?

- (a) strain gauge
- (b) LVDT
- (c) Piezoelectric crystal
- (d) All of these

3. Which of the following adjustments is usually adjusted first in an instrument requiring calibration?

- (a) Span
- (b) Zero
- (c) Hysteresis
- (d) Linearity

4. The dead time of an instrument refers to _____.

- (a) Large change of input quantity for which there is no output.

- (b) The time encountered when the instrument has to wait for some reactions to take place.
- (c) The time before the instrument begins to response after the quantity has altered.
- (d) Retardation or delay in the response of an instrument to a change in the input signal.

5. The primary function of a control valve positioner is to _____.

- (a) Increase transmitter accuracy
- (b) Eliminate cavitation in the valve
- (c) Improve the precision of the valve
- (d) Alter the fail-safe status of the valve

6. The Two Term Controller in a Boiler water level control system uses ____.

- (a) PI Controller
- (b) PD Controller
- (c) ID Controller
- (d) None of these

7. Which of the following is an impressed current anode that is efficient in a marine environment?

- (a) Graphite
- (b) Silicon-iron
- (c) Scrap steel
- (d) Platinized titanium

8. Which of the following is a type of device that is commonly used as a HART master?

- (a) Sensor
- (b) Controller
- (c) Actuator
- (d) Transmitter

9. An Echo sounder is used to measure _____.

- (a) width of the river
- (b) depth of river
- (c) velocity of river
- (d) length of river

10. Following are the components of mechanical rotational systems:

- (a) Mass, Spring and Dashpot
- (b) Moment of inertia, Torsional spring and Dashpot
- (c) Mass, Force and Dashpot
- (d) Moment of inertia, Spring and Torque

Section B

(5 x 2 = 10 Marks)

Answer All Questions

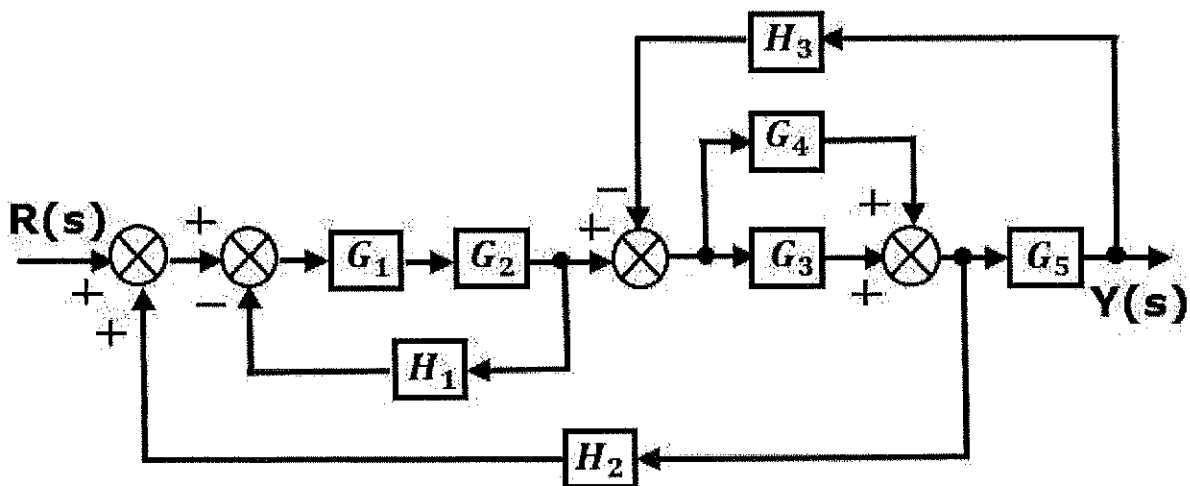
- 11. Distinguish between Overshoot and Error in Control systems.
- 12. What does "Pt100" signify?
- 13. The Derivative control is not used alone in control systems: Justify this statement.
- 14. What are the standard signal levels for Pneumatic transmitters and Electrical transmitters?
- 15. Name few locations of Fire Sensors on board a ship.

Section C

Answer any 5 Questions

(5 x 10 = 50 Marks)

- 16. (a) Compare open loop and closed loop control system and give one practical example of each. (5 marks)
- (b) Explain PID control system and characteristics. (5 marks)
- 17. Determine the transfer function $[Y(s)/R(s)]$ for the block diagram shown in the Figure below. (10 marks)



- 18. (a) Explain the various delays (lags) in control systems? (5 marks)
- (b) Explain square root extractor. (5 marks)
- 19. Explain the principle of operation and working of Thermocouple transducer with a neat schematic and explain its role in thermal measurement on-board a ship. (10 marks)

20. With a neat sketch explain the Main Engine Lubricating oil temperature control system. (10 marks)

21. Discuss in detail the working of three element boiler water level controller with the help of a neat sketch. (10 marks)

22. (a) Discuss the key requirements for the operation of the UMS. (5 marks)

(b) Explain the use of Flapper-Nozzle and discuss its working using a neat diagram. Also, draw its characteristics. (5 marks)

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