

**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**

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Date: 06.04.2024

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

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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/s<sup>2</sup>
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**

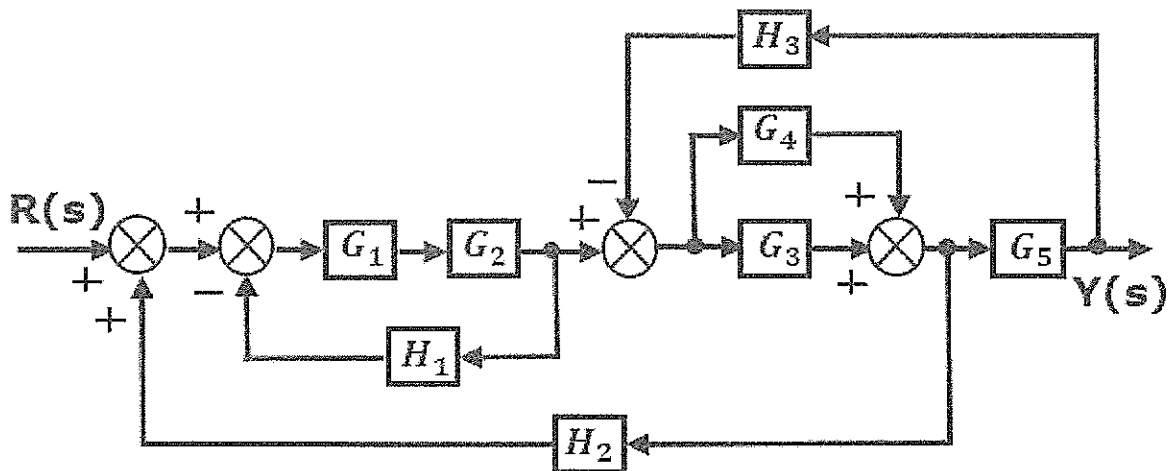
11. Distinguish between Overshoot and Error in Control systems.
12. What does "Pt100" signify?
13. The Derivative control is not used alone in control systems: Justify this statement.
14. What are the standard signal levels for Pneumatic transmitters and Electrical transmitters?
15. Name few locations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