

Indian Maritime University
(A Central University, Govt. of India)

End Semester Examinations – December 2022

Programme Name: B Tech (ME)

Semester: III

Subject Code: UG11T4301

Subject Name: Basic Control Engineering

Date: 13.12.2022

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. A set of reading has a wide range and therefore it has:
 - (a) Low precision
 - (b) High precision
 - (c) Low accuracy
 - (d) Low accuracy
2. Laplace Transform of Unit Step Function is:
 - (a) 1
 - (b) s
 - (c) 1/s
 - (d) 2s
3. A submarine moving deep under the sea have a Pitot tube connected to a differential pressure gauge. The pressure differential as noted by manometric tube attached to the Pitot tube is 20kN/m². Find the speed of the submarine when the density of the water is 1026kg/m³.
 - (a) 6.25m/sec
 - (b) 1.25m/sec
 - (c) 1.75m/sec
 - (d) 4.25m/sec
4. Which of the following transducer is known as an active transducer?
 - (a) LVDT
 - (b) Capacitive microphone
 - (c) Metallic strain gauge
 - (d) piezoelectric transducer
5. 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 respond after the quantity has altered.
- (d) Retardation or delay in the response of an instrument to a change in the input signal.

6. A system possessing the properties of superposition and homogeneity is called

- (a) Non-linear system
- (b) Non homogeneous system
- (c) Superposition system
- (d) Linear system

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

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

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

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

9. A valve positioner:

- (a) Takes the place of a cascade control system
- (b) Provides more precise valve position
- (c) Makes a pneumatic controller in necessary
- (d) Provides a remote indication of valve position

10. In _____ system, float whose weight greater than liquid to be displaced is used.

- (a) Inverse float system
- (b) Displacer system
- (c) Magnifying float system
- (d) None of the mentioned

Section B

(5X2=10 Marks)

Answer Any Five Questions

11. Explain Proportional band.
12. What does "Pt100" signify?
13. Define On-Off control system.
14. Explain Eccentric bore orifice plates.
15. List various Alarms and Trips for a Marine Boiler.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

- 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. (a) What is Ratio Control? (3 marks)
- (b) Determine the transfer function $[Y(s)/R(s)]$ for the block diagram shown in Fig. 1 (7 marks)

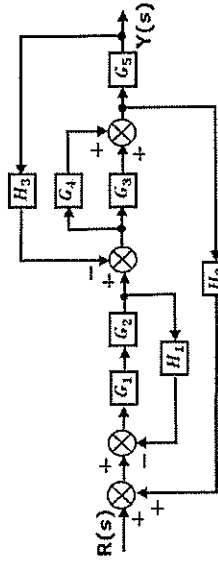


Fig. 1. Block diagram for a system

- 18. (a) Write a comparison between RTD, thermocouple, and thermistors. (5 marks)
- (b) A bonded metal strain gauge has following specification: (5 marks)
 Gauge factor=2.0, Unstrained resistance=120 Ω at 0°C
 Maximum operating temperature=150°C
 Temperature coefficient of resistance= $(2 \times 10^{-5})/^\circ\text{C}$
 Maximum tensile and compressive strain= 2×10^{-2}
 What is the temperature induced resistance error at the maximum operating temperature expressed as the percentage of resistance change due to maximum tensile strain only (assume self-heating effects is zero)?
- 19. (a) Explain square root extractor. (6 marks)
- (b) Discuss Air to Open and Air to Close control valve. (4 marks)
- 20. Discuss the requirements clearly for any UMS ship to sail at sea as per regulation. (10 Marks)
- 21. (a) Describe with sketch three element boiler water level controller. (7 marks)
- (b) Can a rotameter be mounted horizontally? Justify your answer. (3 marks)