

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/m^2 . Find the speed of the submarine when the density of the water is 1026kg/m^3 .
 - (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 unnecessary
 - (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)

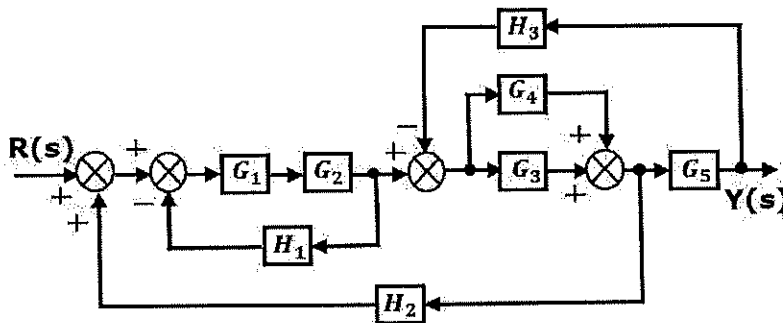


Fig. 1. Block diagram for a system

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)

22. Explain in details of the HART protocol.

(10 marks)

Tolani