

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2024
Programme Name: B Tech (ME)
Semester: III

Subject Code: UG11T4301
Subject Name: BASIC CONTROL ENGINEERING

Date: 06.12.2024 Max Marks: 70
 Duration: 03 Hrs Pass Marks: 35

General Instructions

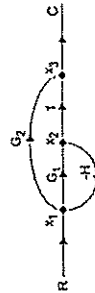
- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

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

1. Precision is defined as _____ (a) repeatability (b) reliability (c) uncertainty (d) sensitivity
2. A zero initial condition for a system refers to: (a) input reference signal is zero (b) zero stored energy (c) no initial movement of moving parts (d) system is at rest and no energy is stored in any of its components

3. Apply Mason's gain formula to determine the transfer function of the given diagram.



- (a) $G_1/(1+G_1H)$
- (b) $G_2/(1+G_1H)$
- (c) $(G_1+G_2)/(1+G_1H)$
- (d) $(G_1+G_2)/(1-G_1H)$

4. The time required for the process control loop to make necessary adjustments to the final control element is called as _____ (a) process time lag (b) control lag (c) dead time (d) hysteresis lag

5. Adding an integral action to a unity feedback system's forward path could result in which of the following outcomes? (a) reduced noise immunity (b) elimination of steady state error (c) increased stability margins (d) fast system response
6. _____ directly converts temperature into voltage. (a) Potentiometer (b) LVDT (c) Strain gauge (d) Thermocouple
7. The resistance of a photo voltaic cell _____ as the intensity of light increases. (a) decreases (b) remains same (c) increases (d) becomes zero
8. What is the function of a control valve? (a) measures the flow rate (b) creates pressure in the system (c) regulates the flow of liquid or gas (d) filters impurities from the fluid
9. The primary goal of a fire alarm system is _____. (a) quick detection (b) reliable transmission of detection signal (c) indicates location of fire (d) all of these
10. SMART transmitter stands for: (a) Single Modular Auto-ranging Remote Transducer (b) Singular Modular Auto-ranging Receiver Transmitter (c) Single Modular Auto-ranging Receiver Transducer (d) Singular Modular Auto-ranging Remote Transmitter

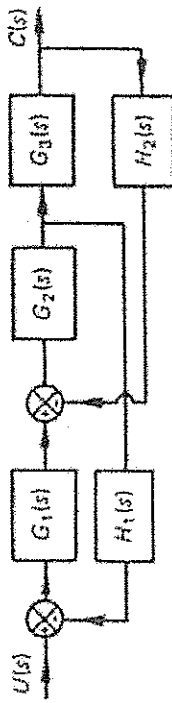
Section B

Five Questions of 02 Marks each

11. List the names of any four flow measuring devices.
12. What do 'fail safe' and 'fail set' signify in pneumatic control systems?
13. What are the standard signal levels for Pneumatic transmitters and Electrical transmitters?
14. Name the types of Diaphragm Actuators and draw its symbol.
15. Describe a control loop. List the key elements of it.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.
 16. Find the overall transfer function $C(s)/U(s)$ using block diagram reduction technique. (10)



17. (a) Explain split-range control in detail. (5)
 (b) Explain the use of a square root extractor with a detailed illustration. (5)
18. (a) Describe any 3 types of temperature sensors used on-board a ship. (6)
 (b) Discuss the operation of the Flapper-Nozzle. Provide its characteristics as well. (4)
19. Discuss in detail the working of three element boiler water level controller with the help of a neat sketch. (10)
20. (a) Draw and explain, how flow rate can be measured using Orifice Plate. (7)
 (b) What is feed forward control system? Explain. (3)
21. (a) Discuss the key requirements for the operation of the UMS. (5)
 (b) Explain on the hydrophore system used on-board vessel. (5)
22. Explain clearly on FO viscosity control system with a neat diagram and label the parts. (10)