Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – September/October 2024

Programme Name: B Tech (ME)

Semester: III

Subject Code: UG11T4301

Subject Name: Basic Control Engineering

Date: 21.09.2024	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

All questions are compulsory (10 x 1 = 10 Marks)

1. Laplace Transform of Unit Ramp Function is:

(A)1

(B)1/s

(C)$1/s^2$

(D)2s

2. The phenomenon in which the measuring equipment exhibits varying output effects during loading and unloading is known as _____.

(A) Drift

(B) Hysteresis

(C) Sensitivity

(D) Precision

3. Reset control means

(A) Proportional Control (B) Integral Control

(C) Derivative Control (D) On-Off Control

4. In PID control, tuning is done first for

(A) P Controller

(B) I Controller

(C) D controller

(D) Any of the controllers

5. _____is an example of the active transducer.

(A) Thermocouple

(B) LVDT

(C) Strain Gauge

(D) Thermistor

6. 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

7. 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

8. An Echo sounder is used to measure _____.

(A) width of the river

(B) velocity of river

(C) depth of river

(D) length of river

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

(A) Span

(B) Zero

(C) Hysteresis

(D) Linearity

10. Following are the components of mechanical translational systems:

(A) Mass, Spring and Dashpot

(B) Moment of inertia, Spring and Dashpot

(C) Mass, Force and Dashpot

(D) Mass, Spring and Torque

Section B

All questions are compulsory **(5 x 2 = 10 Marks)**

11. Define Accuracy and Stability.

12. Can we use Derivative control alone? Justify your answer.

13. Mention the names of various flow sensors

14. What are the standard signal levels for Pneumatic transmitters and Electrical transmitters?

15. What do 'fail safe' and 'fail set' signify in pneumatic control systems?

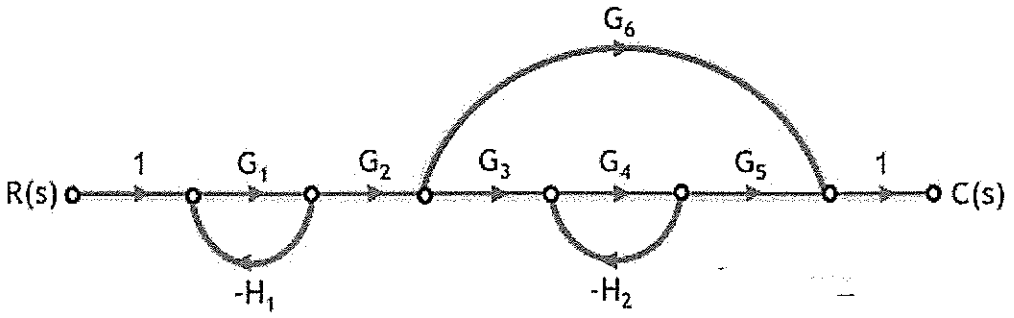
Section C

Answer any 5 questions **(5 x 10 = 50 Marks)**

16. (a) Discuss the advantages and disadvantages of Closed loop control (4)

(b) Explain On-Off Control with hysteresis (6)

17. Estimate the closed loop transfer function $C(s)/R(s)$ of the signal flow graph given below using Mason's gain formula (10)



18. (a) Explain the various delays (lags) in control systems? (5)

(b) Explain Control valve characteristics curves (5)

19. (a) Discuss in detail the working of pneumatic PID controller with the help of a neat sketch. (6)

(b) Explain Flapper Nozzle with its characteristics (4)

20. (a) Explain boiler feed water control using two and three element control strategies. (6)

(b) Draw a neat sketch of Fresh water Hydrophore system using On-Off controller (4)

21. (a) A linear time invariant system initially at rest, when subjected to a unit step input, gives a response $y(t) = te^{-t}$, $t > 0$. What will be the transfer function of the system? (5)

(b)What are the essential requirements of UMS operation? (5)

22. (a) Explain Fuel Oil Viscosity Control System with a neat diagram. (5)

(b) Emphasize the role of actuators in control systems. Also, draw a diagram to demonstrate how a diaphragm type pneumatic actuator works. (5)