

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations – December 2022**  
**Programme Name: B Tech (ME)**  
**Semester: IV**  
**Subject Code: UG11T3407**

**Subject Name: APPLIED MARINE CONTROL AND AUTOMATION**

Date: 05.12.2022

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 the respective section.

**Section A**

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

1. Any externally introduced signal affecting the controlled output is called a \_\_\_\_\_  
a) Feedback  
b) Gain control  
c) Signal  
d) Disturbance
2. Transfer function of the system is defined as the ratio of Laplace output to Laplace input considering initial conditions \_\_\_\_\_  
a) 1  
b) 2  
c) 0  
d) Infinite
3. Viscotherm working principle is  
a) Differential flow is proportional to the viscosity  
b) Differential temperature is proportional to the viscosity  
c) Differential pressure is proportional to the viscosity  
d) None of the above
4. The main purpose of a control valve positioner is to:

- a) Improve the precision of the valve
  - b) Alter the characterization of the valve
  - c) Alter the fail-safe status of the valve
  - d) Increase transmitter accuracy
5. Which of the following uses displacement-to-pressure conversion?
- a) Viscometer
  - b) None of the mentioned
  - c) Gyroscope
  - d) Flapper nozzle system
6. Dipsticks are used for the\_\_\_\_\_
- a) Displacement measurement
  - b) Level measurement
  - c) Flow measurement
  - d) Pressure measurement
7. Relation between temperature and resistance of a conductor is \_\_\_\_\_
- a)  $R_t = R_{ref} [1 + \alpha \Delta t]$ .
  - b)  $R_t = R_{ref} [1 - \alpha t]$ .
  - c)  $R_t = R_{ref} [1 - t]$ .
  - d)  $R_t = R_{ref} [1 + t]$ .
8. The input to a controller is always a/an \_\_\_\_\_
- a) Sensor
  - b) Amplifier
  - c) Error
  - d) Servo
9. The effect of an integral controller on steady-state error ( $E_{ss}$ ) and that on the stability ( $R_s$ ) of the system is
- a) both are reduced
  - b)  $E_{ss}$  is reduced but  $R_s$  is increased
  - c)  $E_{ss}$  is increased but  $R_s$  is reduced
  - d) both are increased
10. In a control system, the controller output is given to:
- a) Comparator
  - b) Amplifier
  - c) Sensor
  - d) Final control element

**Section B**

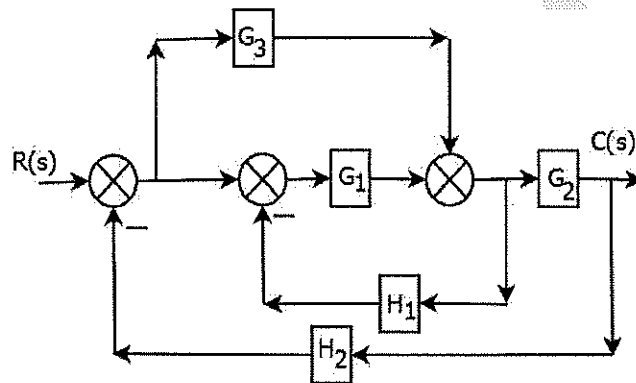
Five Questions of 02 Marks each

11. What is the difference between a Transducer and a Transmitter?
12. Explain the ratio control system?
13. Explain the Poles and the Zeroes of the control system?
14. Write the transfer function of the PID controller.
15. What do you understand by Servomotor?

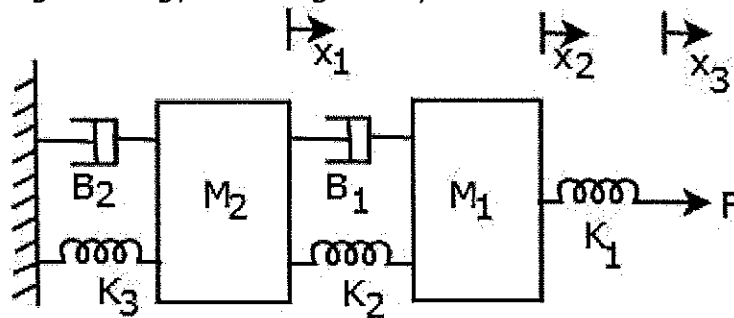
### Section C

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

- 16.a) Explain with a neat sketch the working principle of rotameter. (6)
- 16.b) Explain reset windup in brief. (4)
- 17.a) Reduce the block diagram and obtain its transfer function. (6)



- 17.b) How pneumatic PI controller works? (4)
- 18.a) Explain the three-element feed water control system in a boiler. (6)
- 18.b) Explain lags in control system. (4)
- 19.a) Explain the working principle of AC servomotor with schematic diagram. (5)
- 19.b) Explain Current to Pressure converter (I to P Converter) with neat sketch diagram. (5)
- 20.a) Write system equation for given system. Draw the node diagram. Draw force-voltage analogy for the given system. (6)



- 20.b) Explain the working principle of thermistor. (4)

- 21.a) Explain stack type (Force Balanced Proportional) controller. (5)
- 21.b) Explain basic components of a close loop system. (5)
- 22.a) Explain Boiler combustion control with block diagram. (5)
- 22.b) Explain the working principle of Pneumatic Diaphragm actuator with sketch. (5)

Tolani