

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023

Programme Name: B Tech (ME)

Semester: 3

Subject Code: UG11T4301

Subject Name: BASIC CONTROL ENGINEERING

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| Date: 13.06.2023 | 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. A system's transfer function is defined as the ratio of
- (a) The input Laplace transform to the output Laplace transform with zero initial conditions
 - (b) The input Laplace transform to the output Laplace transform with actual initial conditions
 - (c) The output Laplace transform to the input Laplace transform with zero initial conditions
 - (d) The output Laplace transform to the input Laplace transform with actual initial conditions

2. In terms of the Force-Current analogy, what is the electrical analogous element for the mass element in a mechanical system?

- (a) Inductance
- (b) Capacitance
- (c) Resistance
- (d) Inverse Capacitance

3. A controller having only fully-open and fully-closed positions is known as

- (a) PI controller
- (b) PD controller
- (c) PID controller
- (d) ON-OFF controller

4. Which of the following pair is an active transducer?

- (a) Strain gauge, LVDT
- (b) Inductive proximity sensor, Solar cell
- (c) thermocouple, LVDT
- (d) Thermocouple, solar cell

5. When controller output is proportional to the amount of deviation, the controller is:

- (a) Derivative only
- (b) Integral Only
- (c) Proportion plus reset plus rate
- (d) Proportional

6. A proportional band setting of 175% is equivalent to a gain setting of

- (a) 1.32
- (b) 1.75
- (c) 175
- (d) 0.571

7. In a Double Acting Piston Actuator, the two ports act as _____.

- (a) Both inputs
- (b) Both outputs
- (c) One input and other output
- (d) None of these

8. The output pressure range for a current-to-pressure converter with a flapper-nozzle system is typically _____ for an input current range of 4-20 mA.

- (a) 3-15 psi
- (b) 0-15 psi
- (c) 3-20 psi
- (d) 0-20 psi

9. _____ is a flow meter that employs the variable area principle.

- (a) Venturi meter
- (b) Orifice plate meter
- (c) Rota meter
- (d) Electromagnetic flow meter

10. A first order system with a proportional controller exhibits an offset to a step input. In order to reduce the offset it is necessary to

- (i) increase the gain of proportional controller
- (ii) add a derivative mode
- (iii) add an integral mode

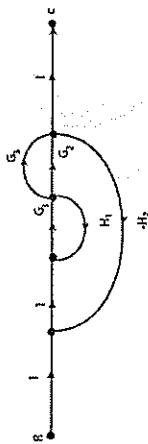
Select the correct answer using the code given below:

- (a) (i) and (iii) Only
- (b) (ii) and (iii) Only
- (c) (i) and (ii) Only
- (d) (i), (ii) and (iii)

Section B

Five Questions of 02 Marks each (5x2=10)

11. Distinguish between Overshoot and Error in Control systems.
12. What is the difference between active and passive transducers? Give one example of each.
13. Name the types of Diaphragm Actuators and draw its symbol.
14. Determine the forward path gains and loop gains in the given signal flow graph.

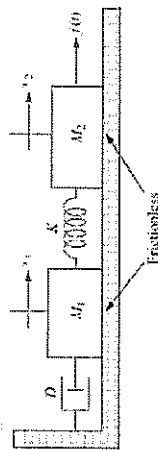


15. What is Reset Time? What would happen on Reset action if reset time is maximum?

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered. (5x10=50)

16. (a) Define the terms: Accuracy, Precision and Sensitivity of a measuring instrument. (5)
 (b) Give advantages and disadvantages of Open loop and Close Loop systems. Also write one example of each. (5)
17. (a) Classify the control valves on the basis of their flow characteristics. (5)
 (b) Draw the analogous electrical circuit of the system shown below. Use F-v and F-i analogy. (5)



18. (a) Define distance velocity lag and Transfer lag. (4)
 (b) What is the effect of P, I and D action on Stability, Accuracy and Speed of response of a control system? (6)

19. (a) Draw and explain, how flow rate can be measured using Orifice Plate. (5)
 (b) Write a short note on HART protocol. (5)
20. Draw neat sketch of Valve Positioner with pneumatic diaphragm actuator and explain its working. (10)
21. Explain Fresh water Hydrophore system using On-Off controller. (10)
22. (a) With a neat sketch explain the working principle of a Pneumatic PID Controller. (4)
 (b) The Temperature of a Process operates within a range of 10000C to 18000C. Kindly select a suitable Transducer and explain its working with neat diagrams to obtain a Precise and Accurate temperature values. (6)