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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JAN 2023**

**Semester :** Semester V - 2020

**Course Code :** MEC3063

**Course Name :** Sem V - MEC3063 - Control Engineering

**Program :** B.Tech. Mechanical Engineering

**Date :** 9-JAN-2023

**Time :** 9.30AM - 12.30PM

**Max Marks :** 100

**Weightage :** 50%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.
  - (ii) Question paper consists of 3 parts.
  - (iii) Scientific and non-programmable calculator are permitted.
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**PART A**

**ANSWER ALL THE FIVE QUESTIONS**

**5 X 2 = 10M**

1. Write 2 Applications of Closed loop Control system  
(CO1) [Knowledge]
2. Consider a thermometer placed in a water bath having temperature  $\theta_i$ , temperature indicated by the thermometer is  $\theta_o$ , write the transfer function of thermometer.  
(CO2) [Knowledge]
3. Write the block diagram for liquid level control system.  
(CO3) [Knowledge]
4. In force-voltage analogy, write the analogous elements for Mass and Friction constant.  
(CO2) [Knowledge]
5. Write the Laplace equation for Torque due to inertia for rotational mechanical System.  
(CO1) [Knowledge]

**PART B**

**ANSWER ALL THE SIX QUESTIONS**

**6 X 10 = 60M**

6. Proportional plus integral (PI) controller. An improved type of proportional controller that provides integral action. PI controllers provide the low sensitivity necessary to produce stable control as well as the small drift characteristic of a high sensitivity instrument. Elucidate about such a controller, also write the graph for Error and output of controller, and write 3 characteristics for such a controller.  
(CO1) [Comprehension]

7. Signal flow graphs are used in analysing the control systems. Elucidate the procedure of converting block diagram into signal flow graph. Also explain the Mason's gain formula used to analyse the signal flow graph.

(CO4) [Comprehension]

8. For the given transfer function, draw the polar plot. It is a type 1 system.

$$G(s)H(s) = \frac{1}{s(1+Ts)}$$

(CO5) [Comprehension]

9. Write and explain the block diagram for automatic bottle filling mechanism. Also write the 4 advantages Block Diagram and 2 disadvantages of Block Diagram.

(CO3) [Comprehension]

10. Write the differences between AC Servomotors and DC Servomotors. Also write the classification of servomotors.

(CO2) [Comprehension]

11. Draw the polar plot on polar system for type 2 system with transfer function equation as given below where T is constant.

$$G(s)H(s) = \frac{1}{s^2(1+Ts)}$$

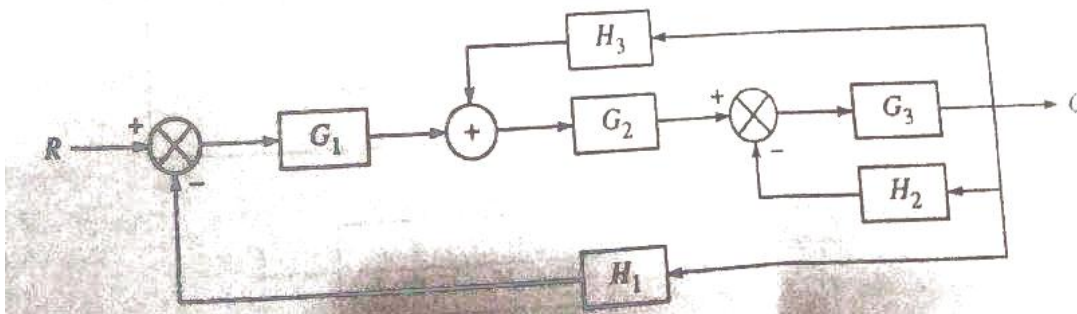
(CO5) [Comprehension]

### PART C

ANSWER ALL THE TWO QUESTIONS

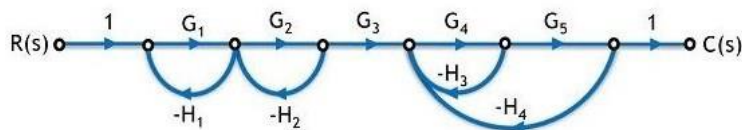
2 X 15 = 30M

12. Reduce the given block diagram using reducing technique and find out the overall transfer function for the given block diagram.



(CO3) [Application]

13. By using Mason's Gain formula, find out  $C(s)/R(s)$  or overall transfer function for the given below signal flow graph.



(CO4) [Application]

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