الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
ME	3	1	Mid Term

MODULE NAME:	**MARINE AUTOMATION**		
MODULE CODE:	**MAUTO**	**EXAM DATE:**	**06.11.2023**
INSTRUCTOR's NAME:	**Dr.Abdul Hameed Kalifullah**	**DURATION:**	**1.5 hrs.**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Pencil & Calculator	(Incl. cover page): **7**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English.**
- Write all the answers in **blue or black pen only.**
- Use the **pencil** only for **diagrams & graphs.**
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

		FINAL MARKS
STUDENT NAME:		**30**
STUDENT ID:		**10**

Number of answer scripts:……..…….. **Invigilator:**……..……..…..

Student's signature: …… **Time of receipt:**……..…..

Answer All questions

1. A ship's crane employs a hydraulic transmission system for lifting heavy cargo. Explain how the hydraulic system works, highlighting the key components and their functions. Discuss the advantages of using hydraulic systems for such applications. **[6 marks]**

2. Explain the concept of a PID controller and its application in marine engineering. Provide a real-world example of how a PID controller is used on a ship and describe its function. **[5 marks]**

3. Explain the working principle of an ON-OFF controller with the help of diagram. Where can such controllers be used on board ships? **[4 marks]**

4. Discuss the advantages and disadvantages of open-loop and closed-loop control systems in the context of marine engineering. Provide examples of each type. **[5 marks]**

5. A ship's dynamic positioning system uses a PID controller to maintain its position during offshore operations. The ship's crew has reported that the current PID controller parameters are not providing the desired level of precision. Your task as a marine engineer is to determine new values for the Proportional Gain (Kp), Integral Time (Ti), and Derivative Time (Td) to improve the ship's dynamic positioning.

   Given the following information:

   The ship's maximum allowable positional error is 2 meters.

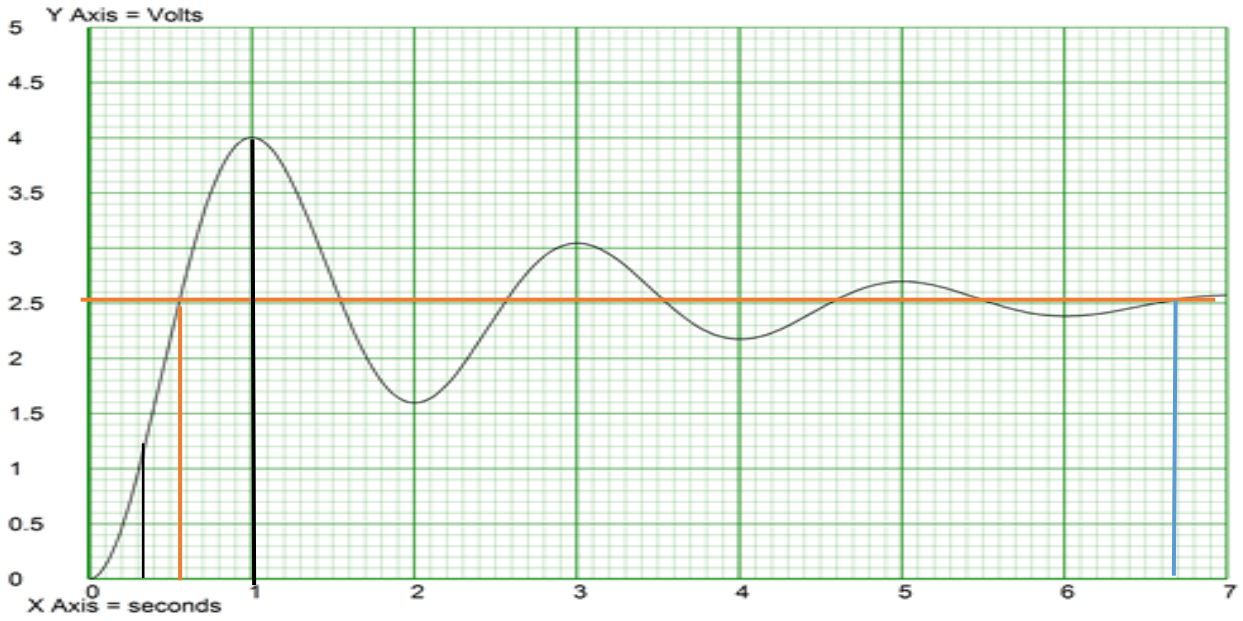
   The ship's current Proportional Gain (Kp) is 0.6.

   The ship's current Integral Time (Ti) is 10 seconds.

   The ship's current Derivative Time (Td) is 3 seconds.

   Calculate the new values for Kp, Ti, and Td to ensure that the ship's dynamic positioning system can maintain a positional error of less than 1 meter during offshore operations. Provide the revised PID parameters and explain your reasoning for each parameter value. **[5 marks]**

6. Measure and write the approximate time domain specifications in the following figure. **[5 Marks]**



(www.sciencedirect.com, n.d.)

MLO & Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	MLO 1,2&4	Application	6	
2	MLO 1,2 &3	Application / Analysing	5	
3	MLO 1&3	Application	4	
4	MLO 1&3	Application	5	
5	MLO 1,2 &4	Application /Analysing	5	
6	MLO 1&3	Application	5	

Reference :-
www.sciencedirect.com. (n.d.). Temperature Controller - an overview | ScienceDirect Topics. [online] Available at: https://www.sciencedirect.com/topics/engineering/temperature-controller.