

**INDIAN MARITIME UNIVERSITY**

(A Central University, Government of India)

**END SEMESTER EXAMINATIONS –DECEMBER 2018**

**B. Tech (Marine Engineering)**

**Semester -VII**

**ADVANCED MARINE CONTROL ENGINEERING AND AUTOMATION  
(UG11T2702)**

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Date: 28.12.2018

Maximum Marks: 100

Time: 3Hrs

Pass Marks: 50

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**PART – A**

(All questions are compulsory) (10x3 = 30 Marks)

1. (a) What do you mean by transfer function?
- (b) Write down the Mason's Gain formula for signal flow diagram.
- (c) Define analogous system and its types.
- (d) What do you mean by basic control action of controllers?
- (e) Define the concept of Off-set in a control system.
- (f) List down the various reasons for employing valve positioners in correcting units.
- (g) Briefly discuss the functioning of a Variable Inductance transducer with the help of a simple sketch.
- (h) Sketch and briefly describe a system for controlling exhaust steam pressure using split range control.
- (i) What are the advantages of a PLC?
- (j) What are the two basic symbols that make up the Relay, "a" and "b" contacts?

## **PART – B**

**(Answer any 5 of the following)**

(5x14 = 70 Marks)

2. (a) A system has  $G(s) = \frac{k}{s(1+sT)}$  with unity feedback where,  $k$  and  $T$  are constants. The overshoot is to be reduced from 75 % to 25 %, Find the factor by which  $k$  should be multiplied. (7 Marks)
- (b) For unity feedback system  $G(s) = \frac{60(s+2)}{s(s^3+7s^2+12s)}$   
Find  
i) Type of system  
ii) Error coefficients.  
iii)  $e_{ss}$  When subjected to input  $8\frac{t^2}{2}$  (7 Marks)
3. (a) Write the advantages and disadvantages of transfer function for a system. (7 Marks)  
(b) Write down the mathematical modelling of field controlled DC motor. (7 Marks)
4. (a) With respect to electronic controllers, Find the overall transfer function for PID controller by using two operational Amplifier. (7 marks)  
(b) What is ON-OFF controller. Illustrate with an example (7 marks)
5. (a) With respect to automatic controllers, explain in detail Pneumatic Proportional + Integral controller. (7 marks)  
(b) Explain the construction of a two-way control valve with a diaphragm actuator. (7 marks)
6. (a) Explain with a neat sketch how Flapper Nozzle arrangement converts mechanical movement to pneumatic signal. With the help of a graph, discuss the linear proportionality of output signal for a Flapper Nozzle arrangement. (7 marks)  
(b) Discuss the functioning of Synchros with the help of a neat sketch. What are its applications. (7 marks)

7. (a) Explain in detail Boiler 3 element feed water control system. How is it different from single element and two element control? (7 marks)
- (b) List down the various requirements of UMS classification of merchant vessels. (7 marks)
8. (a) Explain the working principle of a PLC. (7 marks)
- (b) Draw a simple Block Diagram of a PLC and explain the functions of the components. (7 marks)

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