

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

B.TECH (MARINE ENGINEERING)
Semester – VIII – September 2015 Examination

Advanced Marine Control Engineering & Automation
Subject Code: UG11T1802

Time: 3 Hours

Max Marks: 100

Date: 23.9.2015

Pass Marks: 50

SECTION - A

(3 X 10 = 30 Marks)

Answer All Questions

- 1) (a) State the effects of feedback in a control system.
(b) Explain D'Alembert's principle for writing the equation of motion of mechanical system.
(c) Define the time constant and peak time of a system.
(d) Explain the Pneumatic Relay.
(e) Define the Reset and Rate type controller.
(f) Determine the natural frequency for given system, $\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 16y = 9x$, y is output.
(g) Define source node and sink node for signal flow graph.
(h) What do you mean by order and type of a system?
(i) What is RTD (resistance temperature detector)?
(j) What is Liquid Glass Thermometer?

Section – B

(5 × 14 = 70 Marks)

Answer Any Five of the following

- 2) (a) Write the advantages and disadvantages of an open-loop & closed loop system. (4 Marks)
(b) Show that common mechanical coupling device, i.e. Gear trains also have electrical analogs of transformer. (10 Marks)

- 3) (a) Find out the transfer function from signal flow diagram in figure 1. (7 Marks)

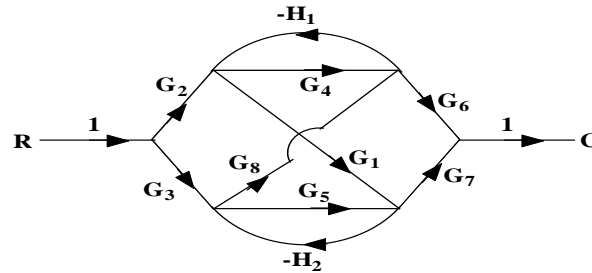


Figure 1

- (b) Drive the expression and draw the system graph for the second order fluid level system.

(7 Marks)

- 4) (a) For a system having $\frac{C(s)}{R(s)} = \frac{20}{s^2 + 7s + 25}$ find its time response specifications and expression for output. (6 Marks)
- (b) With sketch describe principle and operation of Electrical Servomotor. (8 Marks)

- 5) (a) Find the overall transfer function for electronic PI controller. (6 Marks)

- (b) Figure 2 shows a unity feedback system, calculate K when $\xi = 0.56$. Also determine T_p , M_p and ω_d . (8 Marks)

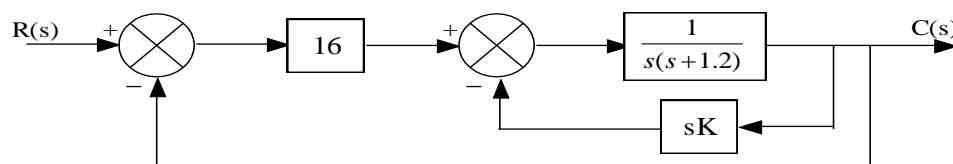


Figure 2.

- 6) (a) Why single element and multi- element control systems are used in Boiler water level control system. (6 Marks)
- (b) Describe with sketch three element Boiler water level control system. (8 Marks)

- 7) Sketch a block diagram showing a bridge control system for operating Main engine in an UMS class vessel and explain it. (14 Marks)
- 8) (a) Sketch and explain a pneumatic operated diaphragm valve actuator with positioner. (7 Marks)
- (b) Describe Main Engine fuel oil viscosity control system with visco-therm. (7 Marks)
- 9) (a) In a flapper-nozzle system with negative feedback show output is proportional to input. (7 Marks)
- (b) Explain with sketch LVDT (Linear Variable Differential Transformer). (7 Marks)
