

Indian Maritime University

(A Central University, Govt. Of India)

B. Tech(Marine Engineering)

Fourth Semester

Applied Marine Control & Automation

(UG11T3407)

Time: 3 Hours

Max Marks: 70

Date: 10.06.2022

Pass Marks: 35

June 2022 End Semester Examinations

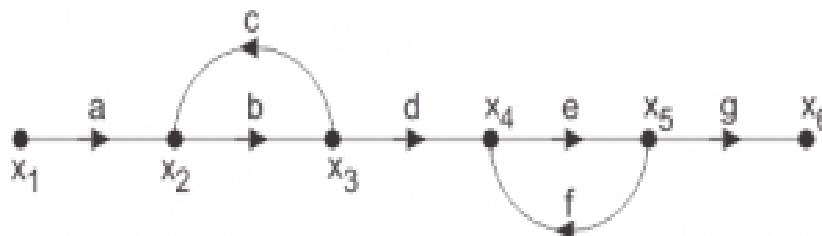
Part A – Q.No.1; 10 MCQs (10 X 01 Mark)

- (i) Which control action increases the steady state accuracy?
- (a) Integrator (b) Differentiator
(c) Phase lead compensator (d) Phase lead compensator
- (ii) Zero initial condition for a system means:
- (a) input reference signal is zero (b) zero stored energy
(c) Time initial movement of moving parts
(d) system is at rest and no energy is stored in any of its components
- (iii) The capacitance, in force-current analogy, is analogous to:
- (a) Damping constant (b) velocity
(c) Displacement (d) mass
- (iv) Despite the presence of negative feedback, control systems still have problems of instability because the
- (a) Components used have non linearity's
(b) Dynamic equations of the subsystems are not known exactly
(c) Mathematical analysis involves approximations
(d) System have large negative phase angle at high frequencies
- (v) The main purpose of a control valve positioner is to:
- (a) Alter the fail-safe status of the valve
(b) Improve the precision of the valve
(c) Alter the characterization of the valve
(d) Increase transmitter accuracy
- (vi) A two-position controller compares conditions to a set point and:
- (a) Starts or stops a process

- (b) A controller output signal
 - (c) Modulates the final control element
 - (d) Maintains the final control element position at 50%
- (vii) The correct sequence of steps needed to improve system stability is:
- (a) use negative feedback, reduce gain and insert derivative action
 - (b) reduce gain, insert derivative action and use negative feedback
 - (c) reduce gain, use negative feedback and insert derivative action
 - (d) insert derivative action, use negative feedback and reduce gain
- (viii) When derivative action is included in a proportional controller, the proportional band:
- (a) Remains Unchanged
 - (b) Increases
 - (c) Reduces
 - (d) Reduces to zero
- (ix) A proportional band setting of 175% is equivalent to a gain setting of
- (a) 1.32
 - (b) 1.75
 - (c) 175
 - (d) 0.571
- (x) Determine the system equation $X(s) / F(s)$ where $M=10\text{kg}$, $B=30 \text{ N/m/s}$, $K=20 \text{ N/m}$:
- (a) $(1/s^2+10s+30)$
 - (b) $1/(30s^2+10s+20)$
 - (c) $1/(1s^2+30s+10)$
 - (d) $1/(10s^2+30s+20)$

Part B – Q.No.2; 5 Short Questions (05 X 02 Marks)

- (i) List any four contact type temperature measuring devices.
- (ii) What do you understand by Split range control system?
- (iii) Explain the basic principle of flapper-nozzle arrangement.
- (iv) Use mason's gain formula to find the transfer function of the given signal flow graph:



- (v) List various alarms and trips for a marine boiler.

Part C – 7 Long Questions-Answer Any 5 (05 X 10 Marks)

- (3) (a) List out the main advantages and disadvantages of Open loop and Closed loop control systems. (5)

(b) Discuss the requirements of an UMS operation of modern ships? (5)

(4) List the advantages of Valve Positioner? Explain the working of Diaphragm actuator with Valve Positioner. (10)

(5) (a) Explain the construction and working of LVDT. (5)

(b) Explain Force-Balance type IP Converter. (5)

(6) (a) What is the effect of Integral action on stability, accuracy, speed of response and overshoot in control loops? (3)

(b) Describe the working of Pneumatic PI controller with proper diagram.(7)

(7) (a) With sketch, describe the working and construction of Oil mist detector. (5)

(b) Describe the working of Ultrasonic Flow Meter with diagram. (5)

(8) Explain ME Jacket Cooling Water Temperature Control System with cascade and split range control. (10)

(9) Determine the transfer function of the system given below. (10)

