Course BE(EEEM)

Batch BE-07

Semester VII

Subject Code EE1702

Subject Name Marine Control Engineering & Automation

UNIT - 1(Control systems)

Part-A

20*2marks

- 1 Define control system
- 2 Define desired value
- 3 Write any two differences between open loop and closed loop system
- 4 What is meant by offset?
- 5 What is meant by feed forward control system?
- 6 What is meant by feedback controller?
- 7 List out the various control modes?
- 8 What is the use of integral control?
- 9 What is the use of reset control?
- 10 What is meant by controlled variable?
- 11 Write the transfer function of a system for a open loop system?
- 12 Write few disadvantages of an open loop control system?
- 13 Write the transfer function of a system for a closed loop system?
- 14 What is mean by cascade control system?
- 15 What is meant by an adaptive control system?
- 16 List any two advantages of Open loop control system
- 17 Define manipulated variable?
- 18 Define Process variable
- 19 Define system

20 Write the expression for a proportional controller?

PART-B

15*6 Marks

1 Define the following terms, set value, desired value, over shoot, offset in Control System?

- 2 Draw the block diagram of feedback control system and explain?
- 3 What are the process time lags, explain?
- 4 Explain adaptive control system with an example?
- 5 What is meant by cascade control?
- 6 Comparison of open loop and closed loop control system
- 7 Draw the PID mode control system for rudder control using OP-AMP circuit?
- 8
- 9 What is ON-OFF control mode? Explain it with necessary waveforms?

10 What is meant by Disturbance in a control system? Give an illustrative example for a temperature process?

- 11 Describe the term 'stability' of Automatic control system?
- 12 Describe the types of Oscillation?
- 13 Draw the graphical Symbols of the following components.
 - 1. Pressure, Temperature, level and Flow sensors.
 - 2. I/P and P/I converters
 - 3. Valve
- 14 Differentiate Transducer and Transmitters?
- 15 Explain Direct and Reverse acting control signal?

PART-C

6*10 Marks

- 1 Explain one of the PID controllers tuning technique in detail?
- 2 Explain a feed forward control system with an example?
- 3 Explain two step PI controllers with an example?

- 4 Explain cascade control system with an example?
- 5 Briefly explain about open loop and closed loop control system with diagram ?
- 6 Briefly explain about feedback and feed forward control system with diagram?

UNIT - 2(Servomechanism)

Part-A

20*2marks

- 1 Define Settling time?
- 2 Define Delay time?
- 3 What is the use of tolerance band for a system?
- 4 Define Rising time?
- 5 What is meant by error detector?
- 6 What is the use of Comparator?
- 7 What is an automatic controller?
- 8 What is meant by a self acting controller?
- 9 Define proportional band?
- 10 What is a synchro?
- 11 What is a three term controller?
- 12 What is hybrid computer?
- 13 What is an analogue computer?
- 14 Draw the integrator using op-amp?
- 15 What is meant by kinetic control system?
- 16 What is meant by regulatory mechanisim?
- 17 What is the IEEE specification of Ethernet?
- 18 What is meant by a relay?
- 19 What are the layers in TCP/IP protocol?
- 20 What are internal utility relay in PLC?

PART-B

15*6 Marks

- 1 Explain Time constant with a practical example?
- 2 Explain Transfer lag of process?
- 3 Explain Distance velocity lag and measurement lag?
- 4 Define Range ability?
- 5 Explain about continuous control?
- 6 Discuss briefly CPP?
- 7 What are meant by Synchro's?
- 8 Explain briefly direct digital control?
- 9 Draw the speed control set up of a DC Shunt motor, and explain briefly?
- 10 Briefly explain hybrid computer?
- 11 Explain about analog computer?
- 12 Compare Analog and Discrete signal?
- 13 List the uses of simulation?
- 14 What is an Operational amplifier?
- 15 List few uses of Op-Amp?

PART-C

6*10 Marks

- 1 Explain the various control modes of a controller with required waveforms?
- 2 Explain the construction and working principle of RTD?
- 3 Describe a closed loop control system with an example and a neat sketch?
- 4 Explain the working principle of Thermocouple with diagram?
- 5 Explain the working principle of PLC and discuss the step process in a PLC operation?
- 6 Explain the main engine starting systems with neat sketch?

UNIT - 3(Transmission)

Part-A

20*2marks

- 1 What is meant by pneumatic controller?
- 2 What is the difference between a transmitter and a transducer?
- 3 What is meant by a voltage comparator?
- 4 Draw the characteristics of nozzle flapper?
- 5 What is meant by a pulse timer?
- 6 What is a on delay timer?
- 7 What is meant by off delay timer?
- 8 What is meant by data memory?
- 9 What is meant by program memory?
- 10 Write any three advantages of PLC?
- 11 What is meant by HMI?
- 12 What are counters?
- 13 What is a coil in PLC?
- 14 What is Opto isolation?
- 15 Define NO and NC?
- 16 Define sinking and sourcing of PLC?
- 17 What are registers used for?
- 18 Define latch?
- 19 What is meant by retentive timer?
- 20 List the types of PLC's?
- PART-B

15*6 Marks

- 1 Draw boiler oil purification control system and explain briefly?
- 2 Give a short note on SCADA system?
- 3 Draw the diagram of a pneumatic PID controller?

- 4 What is meant by a PLC and why is it used? List its advantages?
- 5 Explain TCP/IP protocol?
- 6 Give the scanning process in PLC?
- 7 What is meant by differential relay and draw the schematic diagram?
- 8 Explain the working principle of flapper nozzle?
- 9 Explain a level control application using pneumatic control system?
- 10 Show the nozzle flapper characteristics?
- 11 Draw the ladder logic in PLC for the following condition
 - a. When both the switches S1 & S2 is ON , only then lamp L1 is ON
 - b. If S1 or S2 is ON , then L1 is OFF
- 12 Draw the ladder logic in PLC for the following condition
 - a. Switch S1 should only turn ON the lamp L1
 - b. Similarly, switch S2 should only turn OFF the lamp L1
- 13 Draw the ladder logic in PLC for the following condition
 - a. There are four switches S1,S2,S3 & S4 controls a lamp L1
 - b. Only when any three switches or above are closed the lamp should glow
- 14 Draw the ladder logic in PLC for the following condition
 - a. If S1 and S2 is HIGH , then L1 is OFF
 - b. If S1 and S2 is LOW , then L1 is OFF
 - c. If S1 is HIGH and S2 is LOW , then L1 is ON
 - d. If S1 is LOW and S2 is HIGH , then L1 is ON
- 15 Describe about moment balance mechanism?

PART-C

6*10 Marks

- 1 Discuss the basic instructions and registers of PLC?
- 2 Explain ISO/OSI Protocol in detail?
- 3 Explain in details open loop and closed loop hydraulic circuit with figures?

- 4 Compare the traditional control and PLC?
- 5 Discuss the significant blocks of PLC and list out the advantages of PLC?
- 6 Describe the working of Valve Motor Drive?

UNIT - 4(Correcting units)

Part-A

20*2marks

- 1 What is meant by DCS?
- 2 Define SCADA?
- 3 Define a Control Valve?
- 4 What is meant by an actuator?
- 5 Define FCE?
- 6 Define Flashing?
- 7 Define Cavitation?
- 8 Define Dead band?
- 9 What is meant by Hysteresis?
- 10 Define Drift?
- 11 Define Span?
- 12 Define Plugging?
- 13 Which are the types of control valves?
- 14 What is the necessity of a valve positioner?
- 15 What is a piston actuator?
- 16 What is an electro-pneumatic transducer?
- 17 What is the disadvantage of a continuous bleed type relay?
- 18 Mention two advantages of a positioner?
- 19 What is meant by direct and reverse acting actuator?
- 20 Which are the types of valve positioners?

PART-B

15*6 Marks

- 1 Explain about continuous bleed type pneumatic relay with a neat sketch?
- 2 Explain about true force balance mechanism?
- 3 Compare RLC and PLC?
- 4 Explain about latch instruction?
- 5 Compare DCS and PLC?
- 6 List the advantages of DCS?
- 7 What are the advantages of SCADA?
- 8 Compare SCADA and DCS?
- 9 Explain the characteristics of Fast opening valve?
- 10 Explain the characteristics of linear valve?
- 11 Discuss the construction and working principle of Butterfly valve?
- 12 Discuss the construction and working principle of Gate valve?
- 13 Discuss the construction and working principle of Globe valve?
- 14 Discuss the construction and working principle of Ball valve?
- 15 briefly explain the types of control valves?

PART-C

6*10 Marks

- 1 Explain the working of a diaphragm actuator with diagram?
- 2 Write a note on control valves and explain a self acting control valve?
- 3 Discuss the construction and working principle of Diaphragm valve?
- 4 Explain the combustion control of main boilers?
- 5 Briefly explain about valve positioners with neat Diagram ?
- 6 Explain the auxiliary boiler control system with Diagram?

UNIT - 5(Application of controls in ships)

Part-A

20*2marks

- 1 What is meant by Split control method?
- 2 What is meant by viscosity?
- 3 What is meant by low signal selector?
- 4 What is meant by Purging cycle?
- 5 What is meant by kinematic viscosity
- 6 What is meant by swell effect in a boiler?
- 7 What is meant by high signal selector?
- 8 Define Maneuvering?
- 9 Define Master controller?
- 10 Define Salve controller?
- 11 What is meant by Ignition cycle?
- 12 What is meant by main burner cycle?
- 13 What is meant by shrink effect in a boiler?
- 14 Define PLC?
- 15 Define Error?
- 16 What is mean by System?
- 17 Define Servo mechanism?
- 18 Define interfacing?
- 19 What is meant by Optical isolation?
- 20 Define Timers and Counters?
- PART-B

15*6 Marks

- 1 What are valve positioners, explain them briefly?
- 2 Compare flashing and cavitations?
- 3 What is meant by an actuator and how actuators are selected?

- 4 Draw the arrangement of a piston actuator?
- 5 Draw an electro pneumatic controller?
- 6 Briefly explain electro hydraulic speed control?
- 7 Brief about Direct-acting actuator?
- 8 Discuss about Reverse-acting actuators?
- 9 Explain fuel cooling water temperature control with diagrams?
- 10 Write short notes on feed water circulation system?
- 11 Draw the block diagram of a fuel valve cooling system?
- 12 What are the advantages of using cascade control?
- 13 Draw the block schematic of a three element boiler water level control?
- 14 Explain about two element boiler water level control with diagram?
- 15 Explain the Theory of Wheat stone bridge and its advantages as well?

PART-C

6*10 Marks

- 1 Explain three element boiler water level control with diagram?
- 2 Explain steam temperature control with diagrams?
- 3 Discuss about exhaust steam pressure control?
- 4 Describe the process of piston cooling water control system?
- 5 Explain the process of fuel valve cooling water control system?
- 6 Discuss different cooling control systems used in Marine machineries?