

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations – December 2023**  
**Programme Name: B Tech (ME)**  
**Semester: Fifth**  
**Subject Code: UG11T4504**  
**Subject Name: Marine Steam Plant**

Date: 11.12.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

**Section A**

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Class I pipes for steam systems are those which have ...
  - a. Pressure greater than 60 bar and Temperature greater than 500°C
  - b. Pressure greater than 16 bar and Temperature greater than 300°C
  - c. Pressure greater than 10 bar and Temperature greater than 200°C
  - d. Pressure greater than 7 bar and Temperature greater than 170°C
2. Which of the following statement is correct with regards to Boiler survey
  - a. Waste heat recovery boilers are to be surveyed once every 5 years.
  - b. Auxiliary boilers are to be surveyed every year.
  - c. For vessels fitted with more than one main boiler, survey interval should not exceed 36 months.
  - d. Fire/Smoke tube boilers are to be surveyed every 3 years
3. Select the correct statement
  - a. For Chloride test titration is carried out with N/50 sulphuric acid
  - b. Magnesium Sulphite is used as an Oxygen Scavenger.
  - c. Sea water contains about 30 ppm of Calcium Sulphate
  - d. Sodium Chloride do not form scales in boiler.
4. Select the correct statement
  - a. Feed water pH is maintained around 11
  - b. Presence of Hematite in boiler water indicates proper control
  - c. P Alkalinity indicates alkalinity above pH of 9.4.
  - d. Silica scales are most insulating and has a high volatility in steam

5. Barium chloride is added to boiler water sample to find ...
- Total chlorides
  - Total dissolved solids
  - Alkalinity due to hydroxides
  - Hydrazine reserve
6. Select the correct statement
- The bleed pressures are obtained such that the saturation temperature intervals are approximately equal
  - Excess air for boiler should be above 25 %
  - A reheat cycle is employed when the boiler pressure is above 20 bar
  - Feed pump discharge pressure is equal to boiler pressure
7. Select the correct statement
- Merchant ships usually have 6-7 regenerative feed heaters
  - Deaerator is positioned close to HP turbine
  - Main boilers have an efficiency close to 60 %
  - The LP turbine may have impulse reaction blading
8. \_\_\_\_\_ directly converts temperature into voltage.
- Thermocouple
  - Potentiometer
  - Voltmeter
  - LVDT
9. A smoking burner with a pulsating flame in an auxiliary boiler, is an indication that the \_\_\_\_\_.
- fuel oil supply temperature is normal
  - burner electrode is incorrectly positioned
  - fuel/air ratio is incorrect
  - ignition current is too low
10. Which are the effect of Air Present in the steam system in a steam plant operation:
- It offers a resistance to heat transfer via its layering effect.
  - It reduces the temperature of the steam space
  - It causes corrosion.
  - All the above

## **Section B**

Five Questions of 02 Marks each

11. State the few interacting control loops that are used in steam boiler to insure steam pressure is maintained and that the flows of water, air and fuel are controlled to insure safe, efficient and reliable operation.
12. State the purpose of deaerator on a ship steam Plant?
13. What are the measures taken to prevent carryover in steam?
14. With the help of a diagram show the dependence of boiler efficiency as a function of excess air and stack temperature.
15. Explain stalling in heat exchanger and its effects

## **Section C**

Seven Questions of 10 Marks each of which any 05 questions to be answered.

- 16(a) Draw a feed and condensate system suitable for a steam propulsion plant. Consider three closed feed heaters and one open feed heater. Turbo driven feed pump and atmospheric drain tanks is to be included. (5 Marks)
- 16(b). Write a short note on "heat balance diagram" and bring out its importance in design phase as well as operations. (5 Marks)
17. (a) With the help of a neat sketch bring out the steam demand for tank cleaning. (5 Marks)
- 17.(b) Explain the criteria for pipe sizing, importance of flow velocity. Explain NPS and Schedule number with reference to piping. (5 Marks)
18. (a) State the various types of steam traps used in the steam plant? With a simple sketch explain the operation of any one type? (3 marks)
- 18.(b) State the benefits of providing thermal insulation to steam Lines in a ships steam plant? State at least 3 inspection & maintenance of insulation of steam pipe lines? (3 marks)
- 18.(c) State the various installations provided for waste heat recovery in a High powered Motor Ship? Explain the temperature limitation of waste heat recovery? (4 Marks)
- 19.(a) State the various types of desuperheaters used in a marine steam plant? Explain the difference between de - superheater & Attemperator? ( 3 marks)
- 19(b) State the various quality of condensate drains that are collected from the ships steam plant? Also state the where this drains are collected? (3 marks)
- 19.(c) State the safety consideration for a thermal Oil system? Make a comparison between Thermal oil system to steam? (4 marks)

20. (a) Write a short note on boiler water treatment chemicals used and explain how dosage is calculated (5 marks)

20. (b) Explain the need for removal of Oxygen from boiler water and the working principle of a deaerator. (5 Marks)

21.(a) Explain the approved safety system for a boiler that has the capability to shut it down in the event an unsafe condition is detected. (5 Marks)

21.(b) Explain with a suitable sketch, the parallel positioning method of boiler basic firing rate control. And discuss the advantages and short-coming. (5 Marks)

22. (a) list out the survey intervals for marine boilers ( main, auxiliary, waste heat, fire tube etc) (3 marks)

22.(b) Explain the various Quality of steam & their utilization in a steam plant? State the reason for producing superheated steam & then de-superheating it? (3 marks)

22.(c) Draw a neat sketch indicating a simple waste heat recovery system installed on board motor ships. Indicate dump condenser, circulating pumps, auxiliary boiler etc. (4 marks)