

Indian Maritime University
(A Central University, Govt of India)

Supplementary Examinations – September/October 2024

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4504

Subject Name: Marine Steam Plant

Date: 17.10.2024

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. What is the consequence of exhaust gas temperature falling below the dew point in a waste heat recovery boiler?
 - a. Increased fuel efficiency.
 - b. Formation of sulphurous acid vapour leading to corrosion.
 - c. Reduced emissions.
 - d. Improved steam production.

2. How can corrosion in a waste heat boiler be mitigated?
 - a. By increasing feed water temperature.
 - b. By reducing soot blowing frequency.
 - c. By decreasing boiler pressure.
 - d. By using untreated feed water.

3. Which material is commonly used for heating coils in tankers?
- a) Stainless steel
 - b) Brass
 - c) Yucalbro (copper and aluminium alloy)
 - d) Cast iron
4. What is the primary factor influencing steam volume within bubbles in a boiler?
- a) Steam temperature
 - b) Steam pressure
 - c) Boiler size
 - d) Boiler fuel type
5. What is the primary mechanism of operation for a traditional thermodynamic steam trap?
- a) Expansion and contraction of a metallic bellows
 - b) Movement of a piston in response to condensate buildup
 - c) Dynamic effect of flash steam causing movement of a disc
 - d) Activation of a thermostatic element in response to temperature changes
6. How is heat transferred in a steam tracer line to the product line?
- a) By convection currents in the insulation
 - b) By direct contact through welding
 - c) By radiation only
 - d) By conduction, convection, and radiation
7. 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

8. Select the correct statement

- a. Merchant ships usually have 6-7 regenerative feed heaters
- b. Deaerator is positioned close to HP turbine
- c. Main boilers have an efficiency close to 60 %
- d. The LP turbine may have impulse reaction blading

9. What is the recommended temperature limit for hot water used in tank cleaning to protect rubber seals?

- a) 90°C
- b) 100°C
- c) 60°C
- d) 120°C

10. What is the primary purpose of steam main drainage in a marine steam plant?

- a) To increase pressure within the system
- b) To reduce heat transfer efficiency
- c) To prevent water hammer and improve safety
- d) To minimize the size of steam traps

Section B

Five Questions of 02 Marks each

11. What are the potential methods for testing steam traps? Briefly describe two methods?

12. State the various means available for a Steamship plant, for waste heat recovery from boiler flue gas?

13. What are the measures taken to prevent carryover in steam?

14. Discuss the disadvantages of fixed orifice traps.

15. Explain why it is important to maintain clean boiler heating surfaces in waste heat boilers.

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) Discuss about the various means of extracting the waste heat recovery from engine exhaust and cooling systems (5 marks)

17a) With neat sketch explain the method of crude oil washing (COW) for cargo tank cleaning in motor vessel (7 marks)

b) Explain the factors influencing the total heat demand in a heating process? (3 marks)

18a) Explain the significance of selecting the appropriate size of pipe in a marine steam plant drain system? (3 marks)

18b) Discuss the potential consequences of both undersized and generously sized pipes in such systems? (4 marks)

18c) What steps to be taken for installation drainage lines to prevent water hammer (3 marks)

19a) Explain with a sketch the mode of operation of a traditional thermodynamic steam trap? (5 marks)

19b) Explain the need for removal of Oxygen from boiler water and the working principle of a deaerator. (5 Marks)

20. What is the purpose of feed water control in steam boiler plant? With suitable diagram explain the Three element feed water control system. (3+3+4)

21a) With respect to Thermal Oil used on ship, explain a typical system, including the safety incorporated in such system? (5 marks)

21b) Write a short note on "heat balance diagram" and bring out its importance in design phase as well as operations. (5 Marks)

22 a) Discuss in brief the purpose of Super heater, Attemperator and Desuperheater in in a marine steam plant? (5 marks)

b) Discuss in detail about the steps to be taken for shutting down the boiler for inspection (5 marks)

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