

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2025
Programme Name: B Tech (Marine Engineering)
Semester: V
Subject Code: UG11T4504
Subject Name: MARINE STEAM PLANT

Date: 15.04.2025

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 of 01 Mark each – Choose the correct answer as applicable.

1. While determining steam heating requirement for a tank, on board ships, the total heat requirement may consist of which of the following

Statement 1) The heat required to raise the process fluid and metal temperature from cold to its operating temperature.

Statement 2) The heat lost from the solid and liquid surface of the vessel to the atmosphere.

- a) Only Statement 1 is considered
- b) Only Statement 2 is considered
- c) Both Statements are considered
- d) None of the Statements are considered

2. In a steam heater, if the amount of heat extraction from the steam to the secondary fluid is increased substantially, then (LMTD) (logarithmic mean temperature difference) will become

- a) smaller b) Larger c) remains constant d) no effect on heating

3. The velocity of the saturated steam in the pipelines is normally kept within safe limits to prevent issues like erosion etc. Its value is in the range of

- a) 20 m/sec is the maximum
- b) 25 m/sec to 40 m/sec range
- c) equal to velocity of sound maximum
- d) any range of speed from zero to infinity.

4. Which of the following is a major component found in a Thermal Fluid Heating system

- a) Steam trap b) Condenser c) Steam separator d) Deaerator

5. Which branch of the following type of condensate line in a steam propulsion plant system sometimes carry flash steam

- a) Common return line from steam trap
- b) Drain line to trap
- c) a pumped return line
- d) none of these

6. Without considering Waste Heat Recovery System (WHRS), if heat energy input by the fuel taken as 100%, then heat energy goes with the exhaust gas is approximately equals to

- a) 0.5 to 0.6%
- b) 5 to 8%
- c) 25 to 32 %
- d) 45 to 65%

7. The fundamentals of the steam propulsion plant using steam turbine, Statement 1) working fluid (WF) expands as it flows through a set of fixed blades or nozzles and a portion of the WF enthalpy is converted into kinetic energy. Statement 2 - the high velocity (WF) is directed over the rotating turbine blades causing change in the (WF) momentum.

- a) Statement 1 is a result of statement 2
- b) Only Statement 1 is true
- c) Only statement 2 is true
- d) Both the statements are true

8. In boiler water treatment, the chemicals are dosed to remove the scaling tendencies of boiler water. Which of the following sequence is normally followed to prevent adverse effects

- a) Sodium hydroxide dosed first (required alkalinity attained) then followed by phosphate
- b) Phosphate dosed first (descaling done) then alkalinity raised by Sodium hydroxide
- c) Dosing of phosphate is enough for both descaling and alkalinity.
- d) Dosing of Sodium hydroxide is enough for both descaling and alkalinity.

9. The Blow down control is not carried out to

- a) Adjust the corrosion tendencies of boiler water
- b) Adjust the chloride and acidic content of boiler water
- c) Adjust the scaling tendencies of boiler water
- d) Adjust the heat content of boiler water

10. Which of the items are excluded under boiler survey

- a) Steam receivers and reservoirs
- b) Thermal oil heating systems
- c) Exhaust gas economiser
- d) Exhaust gas receivers

Section B

Answer all. Five Questions of 02 Marks each

11. As per pipe line standards, what is nominal pipe size?
12. What is the purpose of a proper drain system in a steam plant?
13. In waste heat recovery systems (WHRS), heat cannot be recovered up to a very low temperature, why?
14. Why the condensers preferred to run at vacuum in a steam plant?
15. Enumerate the methods for removal of Oxygen from the boiler feed water.

Section C

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

16. (a) Enumerate various steam systems used on board ships? [5 m]
(b) In reference to the use of thermal oil system on board ships, enumerate the properties required for thermal oil system? [5 m]
17. (a) Explain, the schedule number for the pressure service of a pipeline? [4 m]
(b) Specify the reasons for water hammer to happen in steam system piping? [3 m]
(c) What are the effects of stalling in a heat exchanger? [3 m]
18. (a) Why the condensate is reused in a steam system? [3 m]
(b) Explain the type of thermostatic steam trap working on liquid expansion principle. [4 m]
(c) What is tracing steam lines? How they are located with the system piping [3 m]
19. Using the principle of waste heat recovery system, describe with a simple line sketch, a Dual pressure steam system from the Main diesel engine waste heat, popularly used on board ships. [10 m]
20. (a) What are the two basic types of desuperheaters found in modern steam propulsion plants on board ships. [3 m]
(b) What are the general checks carried out for the survey of safety valves of a boiler? [3 m]
(c) Why the water is carried over into the steam flow? [4 m]
21. In reference to a steam propulsion plant used on board ships, Neatly sketch such a propulsion plant layout of your choice and thereby show the positioning of Boiler, superheater, HP turbine and LP turbine driving the propeller via gearbox. Also mention the condensate and feed water line with its main components like condensate pump and deaerator. [10 m]
22. In reference to the control of boilers
 - (a) What is 'turn down ratio' of a burner? What are the values for different type of burners? [3 m]
 - (b) How the "shrink and swell" phenomena pose a challenge for feedwater control in a boiler? [4 m]
 - (c) Explain the 'loss of flame' interlock provided in a boiler? [3 m]

