Indian Maritime University

(A Central University, Govt. of India)

End Semester Examinations – June 2024

Programme Name: B Tech (ME)

Semester: Seven

Subject Code: UG11T3704

Subject Name: ADVANCED MARINE TECHNOLOGY

Date: 20.06.2024 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.
(iii) Use Blue or Black ink only
(iv) Use pencil for all diagrams/ sketches

Section A – (10 x 01 Marks)
Answer all questions in this section

1. In an OIL TANKER, the capacity of each blower must be _____ times the overall capacity of the discharge cargo pump fitted onboard.

a) 1
b) 1.25
c) 1.5
d) 1.75

2. What are the Characteristic features of a bulk carrier?
I) Hopper tank II) Corrugated Bulkhead III) Centerline bulk head IV) multideck

a) Only I & II
b) Only I, II, III
c) Only I, II, IV
d) All of the above

3. Which of the following are NOx control methods
1) Selective Catalytic Reduction II) Exhaust Gas Scrubber III) Improved slide type Fuel Nozzle Design IV) Controlling Sulphur content in Fuel V) addition of Water in fuel injection during fuel injection in engine VI) Exhaust Gas Recirculation.

a) Only I, II, III, V
b) Only I, II, V, VI
c) Only I, III, V, VI
d) All of the above

4. Which of the following are the ventilation requirements on a car carrier.
I) Special category spaces on a passenger vessel having capacity more than 36 passengers.– 10 air changes per hour
II) Closed Ro-Ro & vehicle spaces other than special category spaces for ships carrying more than 36 passengers – 10 air changes per hour
iii) Cargo spaces on a pure Car Carrier in PORT mode – 20 air changes per hour.
IV) Cargo spaces on a Pure Car Carrier in NAVIGATION MODE – 6 air changes per hour.

a) Only I, II, III
b) Only I, II, IV
c) Only I, III, IV
d) All of the above

5. Which of the following cargo and the hazards associated with them are matched correctly?
I) Coal – Emission of Methane
II) Grains – Shifting of cargo
III) Sulphur – Auto Ignition
IV) Cement – shifting of cargo

a) Only I, II, III
b) Only I, II, IV
c) Only I, III, IV
d) All of the above

6. The purpose of turning gear interlock is to:

a) Ensure that Main Engine is free to turn prior starting
b) Allow Main Engine to be turned while lubricating the cylinder liner to spread the cylinder oil on liner walls
c) Ensure that engine cannot be turned on air while the turning gear is engaged
d) All of the above

7. Turbocharger surging may take place under which of the following circumstances:
a) Main Engine load is suddenly increased
b) Main Engine load is suddenly decreased
c) Main engine is brought directly from stop to Full ahead rpm
d) All of the above

8. On a UMS class ship, If the automatic fire detection system in the engine room becomes faulty and cannot be repaired immediately, then which of the following will be most appropriate action to be taken:

a) Engine room can be placed on UMS operation at night with fire rounds being taken every 1 hour interval
b) Engine room to be kept always manned and frequent fire rounds taken by engine watchkeepers

c) The ship needs to be diverted to a port of refuge for getting technicians/spares for repairing the system asap

d) The ship needs to be stopped until the system can be repaired out at sea as essential spares are always available onboard and it is unsafe to sail with system out of order

9. Semi-pressurized LPG can be carried in which of the following type of tank:

a) Moss-spherical type tanks
b) Integral tanks
c) SPB – Self-supporting Prismatic type B tanks
d) Independent type C tank

10. Which of the following pump types can be used as a cargo pump for fully refrigerated gas tankers:
i. Deepwell pump
ii. Submerged electrical motor driven pump
iii. FRAMO pump
iv. Screw pump
Choose the correct answer for the above question from below:

a) Only i) is correct option
b) Both i), ii) are correct options
c) i), ii) & iii) are correct options
d) All of the given pumps can be used

Section B – (05 x 02 Marks)
Answer all questions in this section

11. What do you understand by "Wrong Way" alarm for main propulsion engine? Clearly state from which of the control locations (Bridge, ECR or Local) of the main propulsion engine it is possible that a wrong way alarm may occur.

12. Bring out the stability considerations of a RO-RO vessel.

13. What is crude oil washing (COW). Do we need IG in Tank during COW? Give argument to support your answer. Write benefits of COW.

14. State the problem which can occur in case water is present during loading of cargo on fully refrigerated LPG carrier. In case the problem occurs due to presence of water, on a fully loaded vessel, what remedy is available onboard?

15. Briefly describe the purpose of Knockout drum provided on the suction of a LPG Reliquefaction plant.

Section C – (05 x 10 Marks)
Answer any 5 questions in this section

16. (a) Draw an IG system piping diagram for an oil tanker clearly showing separation of engine room and deck area. **(5 marks)**
(b) Draw and explain Pressure Swing Absorption (PSA) type and Membrane Type Nitrogen Generator. Clearly distinguish the working principle for the same. **(5 marks)**
17. a. What do you mean by "INTELLIGENT ENGINE"? Briefly describe operation of any one intelligent Engine of your choice. **(5 marks)**
(b) Expand the following abbreviations and briefly explain their significance/purpose: EEDI, SEEMP, EEOI, EEXI, CII **(5 marks)**

18. (a) Draw a neat diagram of Framo Pump (Frank Mohn type) and label its parts. Explain the arrangement for checking leaking seal from chemical or oil side. Also explain how you will blow through the discharge pipeline after completing the cargo. **(5 marks)**
(b) Make a neat labelled drawing of any two types of pressure sensing devices used on a chemical tanker. Briefly describe their principle of operation. **(5 marks)**

19. (a) What do you mean by Starting interlocks for main engine? Give examples of any 3 starting interlocks and briefly describe their purpose/working. **(3 marks)**
(b) What do you understand by Main Engine Slowdown? Under what circumstances will Main Engine slowdown. Explain why such circumstances demand engine slowdown? **(3 marks)**
c). With the help of compressor characteristic curves, explain the phenomenon of turbocharger surging. Briefly explain the causes of surging and ways to avoid it. What are the ill effects of surging? **(4 marks)**

20. (a) With the help of simple sketches differentiate between Independent type B and Membrane type of tanks **(4 marks)**
(b) List out the typical insulation materials used for insulating cargo tanks of Liquefied Gas Tankers along with their thermal conductivities. **(3 marks)**
(c) With the help of simple sketch briefly describe compressor/motor room safeties with reference to Gas Tankers. **(3 marks)**

21. (a) What is the main purpose of fixed water spray system installed on the deck of a Liquefied Gas Tanker? List out the locations for which fixed water spray system protection will be provided. State the minimum water flow requirements for horizontal and vertical surfaces? **(1+2+2 marks)**
(b) Briefly describe a Cascade type direct Cargo Reliquefaction system used onboard a LPG carrier. Give example of the cargoes for which such system can be used. What advantages this plant has over 2-stage direct reliquefaction cycle? **(5 marks)**

22. (a) what are the defining features of a Bulk carrier? Draw a neat and clean drawing of cross section of a bulk carrier showing structural arrangement of same. Clearly show the arrangement of Hatch Coaming. Write down some of the advantages of Hatch coaming. **(5 marks)**

(b) Draw a neat and clean drawing of watertight door on a car carrier. Clearly show the arrangements of remote operation of same. **(5 marks)**