Government of the People's Republic of Bangladesh

Department of Shipping

Sample Written Question Bank

Marine Engineer Officer Class 4 & 5 Combined

Motor Engineering Knowledge

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1.0 MAIN AND AUXILIARY ENGINE

1. (a) With the aid of sketch describe the operating cycle of a two stroke diesel Engine (6)
(b) What is overlapping and why it is necessary. (4)

2.(a) State the definition of 2-stroke and 4-stroke engine. (4)
(b) With the aid of sketch describe the operating cycle of a two-stroke diesel Engine (6)

3. (a) Draw and describe the purpose of tie bolt in Main Engine (6)
(b) With is the effect of running engine with loose tie bolt? (4)

4. (a) Why tie rod are very close to the center line? (3)
(b) How to check the tightness of tie rod? (4)
(c) What are the functions of tie rod? (3)

5. (a) Draw a simple diagram of a medium speed diesel engine cylinder liner. (3)
(b) Describe the types of liner wear. (5)
(c) State the maintenance practice to be followed to keep liner wear normal. (2)

6. (a) Describe with an aid of sketch how piston rings seal the combustion chamber. (4)
(b) Brief with sketch different types of piston ring clearance. (4)
(c) What is the function of oil scraper ring? (2)

7. Give the short description on the following: (4 X 2.5) = (10)

(a) Crankcase relief door, (b) Poppet type exhaust valve, (c) Gear teeth backlash, (d) Main engine flywheel markings.

8. (a) Sketch and describe a marine Diesel Engine starting air system. (7)
(b) Describe the safety features used in starting air system. (3)

9. Describe the causes and effects on engine operation with the following fuel Injector faults: (4 X 2.5) = (10)
(a) Incorrect spring pressure setting, (b) Nozzle leakage, (c) Worn nozzle holes, (d) Slack needle

10. (a) Draw a simple diagram of a medium speed diesel engine piston complete.(5)
(b) State the cause and effect on engine if the piston running hot for long time. (5)

11. (a) Draw a complete piston showing the cooling passage. (4)
(b) What are the advantages and disadvantages of piston water cooling and oil cooling system? (6)

12. (a) Why it is necessary to take the liner calibration? (2)
(b) State the condition required & procedure to get the correct liner condition. (8)

13. Describe the causes and effects on engine operation with the following faults: (4 X 2.5) = (10)
(a) Broken piston ring, (b) Leaky exhaust valve, (c) Leaky fuel injection valve, (d) Dirty air cooler.

14. (a) Write down the causes of scavenge fire. (4)
(b) What are the actions to be taken in case of scavenge fire? (4)
(c) What are the safety devices incorporated in an engine to prevent scavenge fire (2)

15. (a) Describe the types of crankshaft and give example of their use. (4)
(b) What are the causes and indication of crank case explosion? (6)

16. (a) What is hotspot? (3)
(b) Mention 4 areas where hot spot may arise in crank case. (4)
(c) What other factors are responsible for crankcase explosion?(4)

17. (a) What is tappet clearance? Why it should be checked regularly? (4)
(b) Describe the causes and effects in case of following condition: (2 X 3) = (6)
i) Exhaust valve early opening, ii) After burning in combustion processes.

18. (a) Describe the reasons and indications of piston crown burning and cracking. (6)
(b) Describe the remedy to avoid piston crown burning and cracking. (4)

19. (a) State the risk assessment for any major overhauling job on diesel engine. (5)
(b) What is running in of a diesel engine and why its necessary? (5)

20. (a) How to prepare a main engine for starting if the engine stops for long time? (5)
(b) What are items to be checked if main engine fail to start? (5)

21. (a) Write down the difference between 2-stroke & 4-stroke engine. (3)
(b) State the types of scavenging for large 2-stroke engine. (3)
(c) Describe the advantages of uniflow scavenging (4)

22. (a) What is the purpose of a turbo charger & how it works? (3)
(b) What are the causes of turbo charger surging? (3)
(c) What are the actions to be taken in case of repeated Turbo charger surging (4)

23. (a) Draw & describe (3 X 2)

(i) Pulse turbocharger system;

(ii) Constant pressure turbocharger

(b) State the advantage & disadvantage of Pulse and Constant pressure Turbocharger (4)

24. (a) What is starting air line explosion? (2)

(b) What are the causes of starting air line explosion? (4)

(c) Describe the safety features used in starting air system. (4)

25. With reference to exhaust valve explain the advantages of the following:

(4 X 2.5) = (10)

(i) Nimonic steel for valve head,

(ii) Stellite deposit on seat faces,

(iii) Roto cap or spring for valve,

(iv) Stem seal.

26. Write short notes on the following: (5 X 2) = (10)

(i) Cylinder relief valve,

(ii) Air starting valve,

(iii) Main engine tachometers

(iv) Indicator cock,

(v) Camshaft

27. For perfect combustion in the engine, define the importance of the following:

(4 X 2.5) = (10)

(i) Viscosity, (ii) Atomization, (iii) Penetration, (iv) Turbulence

28. (a) What is “Diesel Knock” of the diesel engine? (2)

(b) What are the causes of “Diesel Knock” of the diesel engine? (4)

(c) What are the causes of black smoke/exhaust of a diesel engine (4)

29. (a) What is meant by bad combustion of a diesel engine? (2)
(b) What are the causes of bad combustion of a diesel engine? (4)
(c) State the consequences in case of prolong bad combustion. (4)

30. (a) Describe the procedure to take the crank shaft deflection. (7)
(b) Why it is required to take the crank shaft deflection at regular interval? (3)

31. (a) Describe how cylinder power & performance can be assessed for a medium speed engine. (7)
(b) Describe how individual cylinder power can be adjusted. (3)

32. What are the merits and demerits of the followings: (2 X 5) = (10)
i) Hydraulic governor ii) Electric governor

33. (a) Draw a line diagram and explain the function of lubricating oil in a diesel Engine (7)
(b) What is the purpose of cylinder lubrication? (3)

34. Describe the following lubrication method used to lubricate bearing in a small high speed diesel engine & large 2 stroke engine: (4 X 2.5) = (10)
i) Splash lubrication,
ii) Pressure lubrication,
iii) Sight feed lubrication,
iv) Mechanical lubrication.

35. (a) Draw a line diagram of main engine fuel oil service system. (6)
(b) What is viscosity regulator? (2)
(c) Why it is necessary to maintain the viscosity of the engine fuel oil as per the Maker Recommendation. (2)

36. (a) Sketch a cross-sectional drawing of a lubricating oil cooler. (5)
(b) How to find out and rectify the tube leakage in lubricating oil cooler? (5)

37. (a) Draw a line diagram of a jacket cooling water system of medium speed diesel engines. (7)
(b) State the of types chemical dosed in the cooling water and describe the purpose of dosing of each type of chemical.(3)

2.0 CONDUCTING SAFE ENGINEERING WATCH

1. (a) What is safe engineering watch? (3)
(b) Describe the procedure for taking over a watch. (7)

2. (a) What is the purpose of “Engine Log Book”? (3)
(b) Describe the procedure for handing over a watch. (7)

3. (a) What are the duties of a Chief Engineer? (7)
(b) State the C/E’s instruction for M/E operation during rough weather. (3)

4. (a) What is C/E’s (Chief Engineer’s) standing order or instruction? (2)
(b) What are instructions to be given in the C/E’s standing instruction? (8)

5. What are the immediate actions to be taken during watch in the event of following conditions: (4 X 2.5) = (10)
i) Equipment breakdown, ii) In case of fire, iii) Flooding, iv) Collision

6. (a) What are precautions to be taken during watch in case of rough weather? (5)
(b) As a duty watch keeper how you maintain the engine room for fire free? (5)

3.0 AUXILIARY MACHINERY

3.1 AIR COMPRESSOR

1. With respect to reciprocating air compressors:
(a) Define Bumping clearance. (2)
(b) State the effect of incorrect Bumping Clearance on compressor efficiency. (4)
(c) How the bumping clearance can be adjusted? (4)

2. (a) with a cross-sectional drawing describe the principal of two stage an air compressor (6)
(b) Explain the purpose and precautions of the air compressor explosion. (4)

3. (a) What is bumping clearance? (2)
(b) What is the necessity of inter stage cooler in an air compressor? (4)
(c) What are the safety devices incorporated in a reciprocating air compressor? (4)

4. With reference to reciprocating multistage air compressor, state why:
(a) Clearance volume needs to be as small as possible. (3)
(b) Suction & delivery valve are of plate type. (3)
(c) Intercooler is incorporated. (4)

5. (a) How many types of compressor? Why reciprocating type of compressor commonly used? (6)
(b) What are the safety devices incorporate in air compressor and air bottle? (4)

6. (a) Draw a 2-stage air compressor by indicating all parts. (6)
(b) How to carry out air compressor performance test? (4)

4.0 BOILER

1. (a) State a safe procedure of raising steam from cold state of a boiler. (8)
(b) List four important mountings of an auxiliary boiler. (2)

2. (a) State the reasons for boiler water level low. (4)
(b) What are actions to be taken in case of 'boiler water level low' alarm comes? (3)
(c) What are the indications of boiler tube leakage? (3)

3. (a) Describe the reasons of feed water treatment. (4)
(b) State the reasons of any three important tests carried out on feed water of an auxiliary boiler. (6)

4. With reference to an auxiliary boiler:
(a) What are causes and actions to be taken in case of black smoke in the funnel? (5)
(b) Sketch & describe a rotary or pressure jet burner (5)

5. (a) State the significance of maintaining boiler feed water temperature. (3)
(b) If feed water system observed with oil contamination, how to be remedied? (4)
(c) What are precautions to be taken to get rid of scale formation? (4)

6. With reference to an auxiliary boiler:
(a) Explain the difference between fire tube and water tube boiler. (4)
(b) What is the difference between saturated steam and superheated steam? (4)
(c) List the mountings that are normally fitted on a low pressure composite boiler. (2)

7. (a) Sketch a vertical water tube auxiliary boiler & indicate all the important mountings (7)

(b) State the boiler water blow down procedure. (3)

8.(a) Sketch a vertical fire tube auxiliary boiler & indicate all the important mountings (7)
(b) With a sketch describe the boiler water level gauge glass blow down procedure. (3)

9.(a) How boiler corrosion can be prevented? (3)
(b) What is caustic corrosion and pitting? (4)
(c) What are the actions to be taken if found water chloride level beyond the limit? (4)

10.(a) Describe the procedure for complete blow down and depressurized of an auxiliary boiler. (7)
(b) What are the items to be checked in case of miss fire alarm comes during watch? (3)

5.0 MAINTENANCE AND REPAIR

1. (a) What are safeties to be taken before doing any repair job on electrical equipment? (6)
(b) How to isolate electrical equipment before performing the maintenance job? (4)

2. (a) What are the precautions to be taken before main engine major overhauling? (5)
(b) How to make ready the main engine for sailing after major overhauling? (5)

3. (a) What is meant by “Hot Work”? (2)
(b) Shortly write down the content of “Hot Work” permit. (8)
4. (a) What is “Risk Assessment” and why it is necessary? (4)

(b) Make a simple “Risk Assessment” for the hot work (Welding/Cutting) in engine room work shop. (6)

5. (a) Write down the name of any four special measuring tools. (2)
(b) Shortly describe the liner calibration procedure by using special calibration tools. (6)
(c) What is “Torque Spanner” and what is the purpose of it? (2)

6.0 FUEL AND LUBRICATING OIL MANAGEMENT

1. (a) State the functions of lubricating oil in a diesel engine. (3)
(b) Describe the procedure of LO tests which are conducted on board and reasons for these tests. (7)

2. (a) State with reasons, where test samples should be drawn from a main lubricating oil system. (2)
(b) Describe the shipboard lubricating oil test to determine: (4 X 2) = (8)
i) Water content, ii) Comparative viscosity iii) TBN iv) Suspended solids

3. (a) What are the main objectives of cylinder lubrications? (3)
(b) What are the effects of incorrect cylinder lubrication? (4)
(c) Describe the adverse effect of using lower TBN grade of lube oil in the main engine. (3)

4. Considering the main engine system oil management, describe the reasons and remedy of the followings: (4 X 2.5) = (10)
i) Increase in pH level, ii) Presence of water, iii) Low viscosity, iv) Low TBN

5. If large amount of diesel oil had access to lubricating oil sump of an auxiliary engine:
(a) What are the indication and how it can be confirmed? (3)
(b) What is the possible source of leakage? (3)
(c) What would be the result if the engine continued to run at this situation? (4)

6. (a) Briefly describe the cause and effects of bacteria attack of lubricating.
oil. (6)
(b) What the actions to be taken in case of bacteria attack of lubricating oil? (4)

7. (a) What is NOx and SOx? (4)
(b) How does NOx and SOx pollute the environment? How it can be
prevented? (6)

8. (a) Describe the safe bunkering procedure? (6)
(b) What is maximum bunker lift? (2)
(c) What are the things to be considered during bunker calculation? (2)

9. (a) Describe in briefly the procedure of colleting fuel oil samples during
Bunkering (4)
(b) Describe why fuel oil bunkering sample to be sent for lab testing before
use. (3)
(c) What do you understand fuel oil analysis report 'Off-specific'? (4)

10. Describe the effects on the engine performance due to excess presence of following in fuel (5 X 2) = (10)
i) Water, ii) Sulphur, iii) Vanadium, iv) Silicon v) Sodium

11. (a) State the changeover procedure main engine fuel oil system from heavy fuel oil to diesel oil. (7)
(b) Why engine fuel system required to change over from heavy fuel oil to
diesel oil? (3)

12. (a) What is the purpose of oil record book (ORB)? (4)

(b) Lists the contents with Code which to be recorded in oil record book for the Fuel oil bunker. (6)