Note:

1) IAMI EK-Motor Question papers covered from 2017-2024.
2) The content included in this file is only for reference purpose and not for commercial gain.

1) DUTIES & WATCH KEEPING

FEB 2024, Oct 2020, Feb 2018

Q 1) With reference to shutting down a main propulsion diesel engine plant, after a voyage, explain EACH of the following:

a) The conditions to be met for transferring from Bridge control to Engine Room Control just prior to shut down. (8)

b) FOUR precautions to be taken after shutdown, in order to ready the main engine for maintenance. (8)

FEB 2023, Oct 2023, May 2019

Q 1)

a) Describe the actions to be taken by the Engineer Officer of the Watch on discovering scavenge fire (12)

b) State TWO dangers of allowing a scavenge fire to exist. (4)

MARCH 2023, Jul 2019

Q 1)

a) State the reason for turning the engine with the turning gear prior to starting. (4)

b) State the reason for leaving the indicator cocks on main engine cylinders open when the engine is turned initially with the turning gear. (4)

c) State the reason for leaving the lubricating oil circulating after "Finish with Engines". (4)

d) State why diesel alternator cooling water may be circulated through the main engine after shutdown. (4)

May 2023, May 2018

Q 1)

a) In the case of a main engine and Controllable Pitch Propeller not responding to bridge control, describe the routine for changing to and using Engine Room control. (8)

b) Explain how control of fuel pump delivery is achieved when emergency manoeuvring on engine side control of a large 2 stroke crosshead engine. (8)

Dec 2023

Q 1) State the immediate action to be taken in the event of EACH of the following circumstances occurring with a large main propulsion diesel engine, giving the possible consequences of not taking any action for EACH:

a) Turbocharger surging during heavy weather. (4)

b) Excessive vibration from turbocharger at full sea speed. (4)

c) Overheating of air start branch pipe to one cylinder during manoeuvring. (4)

d) High main bearing temperature. (4)

Oct 2022, Dec 2021, Jul 2021, Mar 2018

Q 1) With reference to the operation of main propulsion engines, outline the importance of EACH of the following:

a) Maintaining the temperature of the scavenge air above the dewpoint. (4)

b) Maintaining the fuel at the correct viscosity for injection. (4)

c) Regular on-board testing of the lubricating oil. (4)

d) Ensuring rotation of exhaust valves. (4)

Dec 2022, Jul 2018

Q 1) State the immediate action to be taken in the event of EACH of the following circumstances occurring with a large main propulsion diesel engine, giving a reason for EACH action:

a) Turbocharger surging during heavy weather. (4)

b) Excessive vibration from turbocharger at full sea speed. (4)

c) Overheating of air start branch pipe to one cylinder during manoeuvring. (4)

d) High main bearing temperature. (4)

May 2024, May 2021, Dec 2020, Oct 2017, May 2017

Q 1) State, with reasons, EIGHT areas or items which should be checked by the duty engineer before taking over the watch. (16)

Feb 2019, Feb 2017

Q 1) With respect to Main Propulsion Engines, state the immediate action to be taken as Engineer Officer of the watch in the event of EACH of the following, stating ONE reason for EACH:

a) Turbocharger repeatedly surging. (4)

b) Air start manifold/branch pipe overheating local to one unit. (4)

c) Low scavenge air temperature alarm. (4)

d) Engine misfires, fuel rail pressure low alarm activates, booster pump pressure high. (4)

Feb 2019

Q 4) As engineer officer of the watch explain the procedure to be followed in the event of a crankcase oil mist alarm on a bridge controlled, constant speed, main propulsion engine fitted with a controllable pitch propeller. (16)

Dec 2017

Q 1) Describe the procedure for preparing a main engine, from cold for sea service (16)

2) ENGINE CONSTRUCTION, WORKING & PERFORMANCE

March 2023

Q 2) Describe the function of EACH of the following components of a diesel engine:

a) Chocks. (4)

b) Bedplate. (4)

c) Tie rods. (4)

d) Entablature. (4)

Oct 2023, Dec 2017

Q 2) Explain the constructional differences between 2-stroke Slow Speed and 4-stroke Medium Speed diesel engines. (16)

July 2022, Aug 2020, Dec 2019

Q 2)

a) Sketch a typical power indicator card for a slow speed marine diesel engine. (6)

b) Explain how the card may be used to assess the power developed in the cylinder. (10)

July 2021, Oct 2021, Oct 2019, Mar 2018

Q 2) Describe, with the aid of sketches, the operation of a 4- stroke cycle diesel engine. (16)

Dec 2020, May 2018

Q 2)

a) State TWO differences between a trunk type and a crosshead type diesel engine. (4)

b) Describe, with the aid of sketches, the combustion process of the two-stroke compression ignition engine. (12)

May 2019, Feb 2017

Q 2) Describe the function of EACH of the following diesel engine components

a) Bedplate. (4)

b) Tie rods. (4)

c) Holding down bolts. (4)

d) Crankshaft. (4)

Jul 2018, March 2017

Q 2) With reference to medium speed diesel engine sketch and label a typical arrangement for the piston and connecting rod. (16)

Jul 2018, May 2017

Q 4) With reference to inlet and exhaust valves on a four-stroke diesel engine:

a) Explain why the correct tappet clearances are essential. (8)

b) State the results of the tappet clearances being:

i) Too large. (4)

ii) Too small. (4)

Oct 2018

Q 2)

a) Explain the constructional difference between a slow speed 2 stroke and a medium speed 4 stroke diesel engine with respect to the connection between the piston and the crankshaft. (8)

b) Describe the function of the diaphragm and stuffing box. (8)

Oct 2017

Q 2)

a) With reference to combustion within a two-stroke diesel engine, state the effect of EACH of the following: (4)

i) Early injection. (6)

ii) Late injection. (6)

b) Sketch an Out of Phase diagram (draw card) for a two-stroke diesel engine. (4)

3) CAMSHAFT & CHAIN DRIVE

Feb 2024, Oct 2023, Oct 2018

Q 4) With reference to marine diesel engines:

a) State the purpose of a camshaft. (2)

b) State TWO methods of driving a camshaft on a large marine diesel engine. (4)

c) State the speed of the camshaft relative to the crankshaft on:

i) A four-stroke engine. (2)

ii) A two-stroke engine. (2)

d) Sketch a fuel cam for a unidirectional diesel engine indicating EACH of the following:

i) Point of injection. (2)

ii) Peak. (2)

iii) Slow return. (2)

Dec 2023, Dec 2019, Dec 2017

Q 4)

a) Sketch a camshaft timing chain arrangement indicating how the chain tension is adjusted. (12)

b) State TWO items of ancillary equipment which can be driven via the timing chain. (4)

4) FUEL PUMP & INJECTORS

Dec 2019

Q 3)

a) Describe the testing of a fuel oil injector after overhaul and before it is refitted to the engine. (8)

b) State the stages of onboard preparation of heavy fuel oil prior to use. (8)

Feb 2018, Mar 2017

Q 3)

a) Describe the tests which are carried out on a fuel injector after overhaul. (8)

b) Sketch a section through the nozzle of a fuel injector. (8)

5) SCAVENGING & TURBOCHARGER

May 2024

Q 2) With reference to the diesel engine turbocharger, describe the function served by the following parts:

a) Inducer (2)

b) Diffuser (4)

c) Volute casing (2)

d) Nozzle ring (2)

e) Fir-tree blade root (4)

f) Damping wire (2)

FEB 2024, May 2021

Q 2) Describe, with the aid of a sketch, the operational principles of a main engine exhaust gas turbocharger. (16)

May 2023, Feb 2018

Q 2)

a) Explain the meaning of the term Supercharging and state how it is achieved. (8)

b) State how would you ascertain that EACH of the following components had become fouled:

i) Charge air intercooler. (4)

ii) Air intake suction filters. (4)

July 2022

Q 1)

a) State FOUR important factors which contribute to the initiation of a scavenge fire. (8)

b) State the duties of the Engineer Officer of the Watch on discovering a scavenge fire. (8)

Oct 2022, Oct 2020, Feb 2020, Dec 2018, Jul 2017

Q 2)

a) Describe, with the aid of a sketch, the operational principles of a main engine exhaust gas turbo-charger. (10)

b) State the function of EACH of the following turbo-charger system components:

i) Suction filters. (2)

ii) Exhaust grids. (2)

iii) Charge air cooler. (2)

Dec 2022, Jul 2019

Q 2) With reference to main engine turbochargers:

a) Explain their function. (4)

b) Stating TWO advantages of fitting them. (4)

c) Explain how they are cooled and lubricated. (8)

Oct 2021, Oct 2019

Q 1)

a) Explain the procedure to be carried out before the scavenge space on a large two stroke diesel engine is entered for inspection. (12)

b) State FOUR items that would be inspected inside the scavenge space. (4)

Dec 2021, Feb 2019, May 2017

Q 2)

a) State TWO reasons for fitting an exhaust gas turbocharger to an engine. (4)

b) For EACH of the following, describe the effect of dirty or restricted:

i) Air filters. (4)

ii) Exhaust gas turbine. (4)

iii) Outline how the exhaust gas turbine is cleaned. (4)

Feb 2020, Aug 2020

Q 1) With reference to scavenge fires:

a) State FOUR possible contributing factors. (4)

b) Explain how EACH factor mentioned in (a) contributes. (8)

c) State FOUR indications. (4)

Oct 2018, Mar 2017

Q 1) With reference to scavenge fires in large slow speed diesel engines, state FOUR actions to be taken by the Engineer Officer of the Watch on discovering EACH of the following:

a) one engine unit only affected. (8)

b) several engine units affected at the same time. (8)

6) CRANKCASE & OMD

FEB 2024

Q 2)

a) Sketch and label an obscuration type oil mist detector that incorporates a reference tube. (8)

b) Explain the operation of the sketch drawn in part (a). (8)

May 2021, Jul 2021, May 2018

Q 4) With reference to main engine crankcase explosions:

a) State TWO causes. (8)

b) Explain how the effects are minimised. (8)

March 2017

Q 4)

a) State the name of the equipment used to give a warning of the presence of conditions that could lead to an explosion in the crankcase of a diesel engine. (2)

b) Sketch and describe the device used to relieve any excess pressure that might develop as a result of a crankcase explosion in a diesel engine. (14)

7) FUEL OIL & SYSTEM

March 2023, Oct 2023, July 2022, Oct 2019

Q 3) Describe the procedure to change the fuel supply of the main propulsion engine from high viscosity fuel to low viscosity fuel such as diesel oil on passage. (16)

May 2023, May 2019

Q 3) With reference to high viscosity fuel oil:

a) Explain how it is treated between storage tank and main engine. (10)

b) State the purpose for the treatment explained in part (a). (6)

Oct 2022, May 2018

Q 3)

a) Explain how high viscosity fuel oil is treated prior to entering the main engine. (8)

b) State the changes in the fuel preparation required when changing to a fuel of lower density and viscosity. (8)

May 2021, Dec 2018

Q 3) Describe a heavy fuel oil system from settling tank to fuel oil injector of the main engine. (16)

Mar 2018

Q 3) Draw a line diagram of a fuel oil system from fuel oil bunker tanks to the daily service tank, for a large diesel engine plant using HVFO. Label all the main components of the system including any safety devices fitted. (16)

8) LUBRICATING OIL & SYSTEM

Dec 2023

Q 2) With reference to marine diesel engine lubrication:

a) Define EACH of the following terms:

i) Viscosity. (1)

i) Viscosity Index (VI). (1)

ii) Pour point. (1)

iii) Flash point. (1)

b) Describe FOUR important characteristics of lubricating oil. (8)

c) State FOUR important additives found in lubricating oil. (4)

Dec 2022, Dec 2021, Oct 2021, Jul 2018, Jul 2017

Q 3) Draw a line diagram of a main lubricating oil system for a large two-stroke cross-head type diesel engine. Label all the principal components of the system. (16)

9) COMPRESSED AIR SYSTEM

March 2023, Oct 2019, Dec 2018

Q 4) With reference to main start air compressors:

a) State how a deterioration in the efficiency would be detected. (4)

b) State FOUR causes for deterioration in efficiency. (8)

c) Describe a test for establishing performance. (4)

May 2023, Jul 2022, Feb 2020, Jul 2017

Q 4) With respect to two stage reciprocating compressors used for air start purposes:

a) State FOUR reasons for taking too long to fill the main starting air bottles. (8)

b) State FOUR safety devices that may be fitted. (8)

Oct 2022, Aug 2020, Feb 2018

Q 4) With reference to main starting air compressors:

a) State THREE maintenance procedures that maintain their efficiency. (6)

b) Describe the procedure for the manual starting of a compressor. (10)

Oct 2020, Jul 2019, May 2019, Feb 2017

Q 4) Sketch a cross section through a two-stage main starting air compressor, labelling the main components. (16)

10) COOLING SYSTEM & FWG

FEB 2023, Oct 2018, FEB 2017

Q 3) With reference to a main engine jacket water cooling system:

a) Explain, with the aid of sketches, how the jacket water temperature is maintained at its optimum value. (8)

b) State the possible effects on the engine if the jacket water temperatures are maintained outside the desired value. (8)

May 2024, Dec 2023

Q 3) With reference to the diesel engine cooling system:

a) Explain why cooling is necessary. (4)

b) State the purpose of EACH of the following:

i) Jacket water heater. (4)

ii) Jacket water drain tank. (4)

ii) Header tank. (4)

FEB 2021 Oct 2017, May 2017

Q 3) With reference to jacket cooling Water treatment of a diesel engine:

a) State the chemical tests carried out. (6)

b) State the frequency of testing. (2)

c) Explain why it is necessary to keep the test results within certain limits. (4)

d) State the action to be taken to rectify an abnormal test result. (6)

July 2021, Feb 2020

Q 3)

a) Make a labelled diagram of a jacket cooling water system. (8)

b) State the purpose of the major components shown in the sketch in (a). (8)

11) STARTING & CONTROL

FEB 2023, Dec 2020, Oct 2017

Q 4) With reference to the reversing of an engine:

a) Describe THREE methods by which it may be achieved. (12)

b) Explain what is meant by lost motion. (4)

May 2024, Dec 2022, Oct 2021

Q 4) With reference to a small diesel engine that requires the use of a starting handle:

a) State the procedure for starting. (8)

b) State EIGHT reasons that would cause difficulty in starting. (8)

Dec 2021, Mar 2018

Q 4) With reference to two stage water cooled reciprocating main engine starting air compressors:

a) Describe, with the aid of a sketch, a protective device fitted to the water side of the intercooler or aftercooler. (8)

b) Explain why the device described in (a) is fitted. (4)

c) Describe the possible consequences should the device described in (a) fail to operate. (4)

Aug 2020, Dec 2020

Q 3) Sketch a simple cross section through an air start valve for a marine diesel engine. (16)

12) WHRS & BOILER

May 2024, Dec 2021, May 2018

Q 5) With reference to auxiliary boilers:

a) Explain how scale forms on the heating surfaces. (8)

b) State TWO reasons why scale is undesirable. (4)

c) State how scale build up is prevented from forming in steam boilers. (4)

FEB 2024, Oct 2022

Q 5) List FOUR safety or alarm devices fitted to an automatically controlled auxiliary boiler indicating how EACH of these devices may be tested. (16)

FEB 2023, Dec 2022, Mar 2018

Q 5) With reference to auxiliary boilers:

a) State the effect on operation in the event of EACH of the following conditions:

i) High water level. (2)

ii) Low water level. (2)

iii) Extra-low or low-low water level. (2)

b) Describe the procedure for verifying water level in low-pressure boiler gauge glass (10)

March 2023, Jul 2022, Oct 2021, Dec 2019

Q 5) Describe, with the aid of sketches, the procedure for testing a boiler gauge glass. (16)

May 2023, Jul 2021, Dec 2020, Feb 2020, Jul 2017

Q 5) With reference to an auxiliary boiler. state for EACH of the following circumstances the action to be taken, giving a reason for EACH action:

a) No water level visible in gauge glass. (4)

b) Safety valve lifting. (4)

c) Excessive smoking during firing. (4)

d) Excessively high chloride content of boiler water. (4)

Oct 2023, Dec 2018

Q 5) List EIGHT mountings which must be present on auxiliary marine boilers. (16)

Dec 2023, Jul 2019, May 2019, Feb 2017

Q 5) State FOUR tests which are required for boiler water, giving a reason for EACH test. (16)

May 2021, Jul 2018

Q 5)

a) State TWO consequences of not treating the water in a boiler. (4)

b) Outline TWO tests which are carried out on boiler water. (12)

Aug 2020, May 2017

Q 5) Explain the sequence of events that occur no pressing the start button of an automatically controlled oil-fired package steam boiler. (16)

Oct 2020, Feb 2019

Q 5)

a) State FOUR possible reasons for the boiler feed pump failing to maintain the water level in an Auxiliary Boiler. (8)

b) Describe the start-up sequence of the boiler burner. (8)

Oct 2019

Q 5) State the possible cause, and outline the remedial action that should be taken when EACH of the following faults occur during starting of an automatic package boiler:

a) The boiler starts and the fan runs with the control dampers correctly positioned, the boiler then locks out before purging is completed. (4)

b) The boiler purges correctly, but the ignitors fail to spark, and the boiler locks out. (4)

c) The boiler purges correctly, the ignitors spark, but the boiler fails to light up and locks out. (4)

d) The boiler flame flashes up but after about 5 seconds the automatic control locks the boiler out. (4)

Dec 2019, Dec 2018, Jul 2017

Q 1) With reference to fires in diesel engine uptake economisers:

a) state TWO indications of a fire in an economiser. (4)

b) List the course of action to be taken in the event of a fire occurring in an economiser whilst on passage. (12)

Feb 2018

Q 5)

a) State the name given to the water level indicators mounted on a boiler. (2)

b) State why at least two of the items stated in (a) are fitted. (4)

c) List FIVE boiler mountings which are subject to survey, other than those stated in (a). (10)

Oct 2018

Q 5)

a) Sketch an open feed system suitable for an auxiliary boiler, labelling the component parts. (12)

b) Indicate on the sketch in the components that allow for leakage and expansion within the system. (4)

March 2017, Dec 2017

Q 5) State FOUR circumstances under which the fuel supply to the burners of an auxiliary boiler would be automatically cut off, giving a reason why EACH circumstance requires the fuel to be cut off. (16)

Oct 2017

Q 5) State the consequences of not testing or treating the water in a boiler. (4)

a) For a fire tube auxiliary boiler.

i) Explain how scale may form on the heating surfaces. (4)

ii) State FOUR tests which are usually carried out on the boiler water . (8)