D. MARINE
Study Material

MEO CLASS 2 WRITTEN: EKM

(ENGINEERING KNOWLEDGE MOTOR)

FOR INDIAN COMPETENCY EXAM

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D. MARINE
Study Material

JAN-2022

Q1. Show with the aid of a sketch how fuel can be continuously circulated through fuel- injection valves on large engines while the engine is operating or under, stand-by conditions.
2021/MAR/Q2 **2021/SEP/Q2** **2021/DEC/Q7** **2022/JAN/Q1**
Click Here to See the Answer

Q2. As a second engineer of a vessel, you are instructed to submit to the superintendent engineer a complete indicator card together with relevant data. Give full account of your work in taking the cards and preparing them for submission. Tabulate the data you forward, both that extracted from the cards and otherwise obtained, giving typical figures taken from a motor ship.
2020/FEB/Q6 **2021/MAR/Q3** **2022/JAN/Q2**
Click Here to See the Answer

Q3. (a) Sketch a typical power indicator card for a slow speed marine diesel engine.
(b) Explain how the card may be used to assess the power developed in the Cylinder.
2022/JAN/Q3
Click Here to See the Answer

Q4. With reference to Main engine piston rings:
(a) Analyze the causes of piston ring breakage.
(b) How maintenance and engine operation can minimize piston ring breakage.
(c) Explain the possible consequences with respect to performance and safety of operating the engine with broken or severely worn piston rings.
2021/MAR/Q4 **2022/JAN/Q4**
Click Here to See the Answer

Q5. With respect to Air Starting systems for 2 stroke diesel engines:
A. Sketch a Main Engine starting air starting system and describe how it operates.

B. List the safety devices and interlocks incorporated in main engine air starting system and state the purpose of each.
2020/NOV/Q6 **2020/DEC/Q2** **2021/MAR/Q9** **2021/JUL/Q7** **2021/SEP/Q3** **2021/NOV/Q7** **2022/JAN/Q5**
Click Here to See the Answer

Q6. With reference to bridge control of a large slow speed propulsion engine.
A. How is starting and reversing achieved?
B. Investigate and suggest remedial action required if the engine,
(i) Fails to turn on air.
(ii) Turns on air but fails to fire on fuel;
(iii) Fails to reverse.
2020/DEC/Q1 **2021/FEB/Q5** **2021/APR/Q3** **2021/OCT/Q2** **2022/JAN/Q6**
Click Here to See the Answer

Q7. With reference to medium speed engine cylinder liners:
A. Explain the cause and effects of Polishing or glazing;
B. Describe, with the aid of sketches, an anti-polishing ring and how it is fitted in the liner;
C. Explain the action of anti-polishing ring during the operation of the engine.
2020/DEC/Q5 **2021/MAR/Q6** **2021/JUL/Q8** **2022/JAN/Q7**
Click Here to See the Answer

Q8. How are large slow speed engines structured to withstand the following forces?
A. Forces due to combustion load;
B. Guide forces;
C. Inertia forces.
2022/JAN/Q8
Click Here to See the Answer

Q9. With regards to connecting rod ovality of four stroke diesel Engine. Explain Following.
a) Importance of connecting rod ovality.
b) Method of measuring the connecting rod ovality.

C) Discuss the impact of ovality if it increases beyond the maximum allowable limit.
d) Method of ascertaining the elongation of connecting rod bolts.
2021/MAR/Q8 **2021/APR/Q4** **2021/SEP/Q7** **2022/JAN/Q9**
Click Here to See the Answer

FEB-2022

Q1. (a) Explain the factors you would consider in deciding whether to open up a cylinder unit for overhaul? After opening the unit and preparing for assembly, how would you decide whether to renew or re-use piston rings?
(b) List the causes of piston ring failure which may result in gas leakage or ring breakage.
2020/DEC/Q3 **2021/JUL/Q4** **2021/SEP/Q1** **2021/NOV/Q4** **2022/FEB/Q1**
Click Here to See the Answer

Q2. A. Sketch and describe a control system for maneuvering a main diesel engine from the bridge
B. Explain how local control may be effected in case of breakdown of the control system described in 2 (A).
2021/APR/Q5 **2021/JUL/Q2** **2021/AUG/Q3** **2022/FEB/Q2**
Click Here to See the Answer

Q3. (a) Explain fatigue cracking, stating its causes and propagation.
(b) Explain, how poor maintenance and engine overload may contribute to the risk of fatigue cracking of cylinder head holding studs.
2021/OCT/Q9 **2021/NOV/Q8** **2022/FEB/Q3**
Click Here to See the Answer

Q4. Misalignment of the main shafting between engine and propeller causes bearing overloads and shaft stress;
A. State the difficulties associated with checking shaft alignment and the reasons why results are unreliable due to external factors;
B. Explain with a simple sketch how a bearing load is assessed.
C. Explain how uneven loading could be rectified.
2021/AUG/Q4 **2022/FEB/Q4**

Click Here to See the Answer

Q5. With reference to the crankshaft and running gear of an engine, explain static balance, Dynamic balance, Torque reaction couple, and Critical speed
2021/AUG/Q5 **2022/FEB/Q5**
Click Here to See the Answer

Q6. A. Explain the term Variable Injection Timing (VIT) when applied to fuel pumps and state why a change in timing of fuel injection may be required.;
B. Describe, with the aid of sketches a VIT fuel pump and explain how the change in timing is achieved whilst the pump is in operation
C. Explain how it may be determined that individual fuel pumps are injecting the correct quantity of fuel with the correct timing at a particular pump setting.
2021/APR/Q7 **2021/JUL/Q6** **2021/AUG/Q6** **2022/FEB/Q6**
Click Here to See the Answer

Q7: Using sketches explain the difference between "Pulse" and "Constant Pressure" turbocharger systems.
(a) In the event of one of the pulse turbocharger's becoming inoperative due to mechanical breakdown explain the modification required to allow the engine to operate safely.
(b) State the instruction you as second engineer would issue regarding the additional engine monitoring requirements following the steps taken in (a).
2022/FEB/Q7
Click Here to See the Answer

Q8. (A) A set of indicator diagrams including draw cards has been taken for a main diesel engine, noted that compression curve is normal. Examine critically and give reasons for following observations.
i. The maximum pressure is lower;
ii. The maximum pressure is higher;
iii. The expansion curve is lower;
iv. The expansion curve is higher.
(B). Describe how the faults as mentioned above can be rectified
2021/JUL/Q3 **2021/AUG/Q7** **2022/FEB/Q8**

Click Here to See the Answer

Q9. Write a report to the engineering superintendent regarding the replacement of the fuel injectors of three main engine units due to severe erosion of the nozzle holes and burning of the injector tips. Explain in your report how the defects were detected, the likely cause of the damage and the action taken to prevent further incidents of this
type.
2021/SEP/Q9 **2022/FEB/Q9**
Click Here to See the Answer

MARCH-2022

Q1. Describe the starting and reversing system of an electronically controlled diesel engine and compare with engine having CAM SHAFT and explain the following;
A. Reduction in Air Consumption during Engine Starting;
B. Improved performance during Astern starting and Crash Astern.
2021/MAR/Q5 **2021/APR/Q8** **2021/SEP/Q8** **2021/DEC/Q1** **2022/MAR/Q1**
Click Here to See the Answer

Q2. Sketch a Main Engine air starting distributor and describe how it operates. List the safety devices and interlocks incorporated in main engine
2020/OCT/Q6 **2020/NOV/Q6** **2020/DEC/Q2** **2021/APR/Q9** **2021/DEC/Q9** **2022/MAR/Q2**
Click Here to See the Answer

Q3. (a) Explain how surging happens in large two stroke main engine's turbocharger? State possible reasons why turbocharger surges?
(b) Explain the step by step procedure you will follow when the turbocharger turbine blades are damaged and no spares available onboard to overhaul the turbocharger and it warrants to operate the main engine so that vessel reaches safely to port.
2022/MAR/Q3
Click Here to See the Answer

Q4. Explain why auxiliary engine bottom-end bolts are prone to failure, even under normal running conditions. Identify those features, incorporated into the design of bottom-end bolts, to inhibit failure. Explain how this tendency is either aggravated or inhibited during maintenance and what checks are to be carried out.

2021/DEC/Q4 **2022/MAR/Q4**

Click Here to See the Answer

Q5. With reference to mechanical/hydraulic governors explain:
A. Why flyweights are driven at a higher rotational speed than the engine;
B. How dead band effects are reduced;
C. How hunting is reduced;
D. How the output torque is increased.

2020/NOV/Q8 **2022/MAR/Q5**

Click Here to See the Answer

Q6. (a) Explain fatigue cracking, stating its causes and propagation.
(b) Explain, how poor maintenance and engine overload may contribute to the risk of fatigue cracking of cylinder head holding studs.

2021/OCT/Q9 **2021/NOV/Q8** **2022/FEB/Q3** **2022/MAR/Q6**

Click Here to See the Answer

Q7. With respect to large two stroke crosshead main engines;
A. Sketch and describe a crosshead designed to prevent or minimize bearing edge loading.
B. State how the arrangement describe a achieves its purpose.
C. What would be an acceptable range of bearing clearance for the top end bearing and bottom end bearings of a large two-stroke marine diesel engine.

2021/MAR/Q7 **2022/MAR/Q7**

Click Here to See the Answer

Q8. With reference to main boiler super heater arrangements:
(a) Compare the advantages and disadvantages of contra flow with parallel flow design.
(b) How the element tube bank is supported and yet allow for expansion?
(c) How boiler carryover affects super heater effectiveness?

2021/APR/Q7 **2021/DEC/Q8** **2022/MAR/Q8**

Click Here to See the Answer

Q9. With reference to a large slow speed 2 stroke engine:
(a) Draw a simple sketch (cross section) of a lubricating oil type piston, showing the flow path of Lubricating oil and label the various components of piston.
(b) Explain how the piston's crown is cooled effectively during the operation of the engine by lubricating oil.
(c) Compare advantages and disadvantages of lubricating oil piston cooling systems with Fresh water piston cooling systems.

2021/DEC/Q3 **2022/MAR/Q9**

Click Here to See the Answer

APRIL-2022

Q1. Explain the term 'cascade control' and sketch such a system suitable for use with a main engine jacket cooling water system. Show the variation of pressure and temperature at major points of the system.

2020/NOV/Q4 **2021/JUL/Q5** **2021/NOV/Q5** **2022/APR/Q1**

Click Here to See the Answer

Q2. A. Outline the problems associated with improper lubrication of the liner and piston assembly of a large slow speed engine.
B. Describe and state the causes of each of Clover leafing and Micro-seizure
C. List out the composition of a cylinder oil suitable for an engine operating on VLSFO.

2020/JAN/Q2 **2021/APR/Q2** **2021/DEC/Q2** **2022/APR/Q2**

Click Here to See the Answer

Q3. With reference to bridge control of a large slow speed propulsion engine.
A. How is starting and reversing achieved?
B. Investigate and suggest remedial action required if the engine,
(i) Fails to turn on air.
(ii) Turns on air but fails to fire on fuel;
(iii) Fails to reverse.

2020/DEC/Q1 **2021/FEB/Q5** **2021/APR/Q3** **2021/OCT/Q2** **2022/JAN/Q6** **2022/APR/Q3**

Click Here to See the Answer

Q4. Describe the phenomena of vibration in marine diesel engine. Explain the terms:

(a) Transverse Vibration
(b) Torsional Vibration
(c) Resonance
(d) The role of vibration dampers .
2021/FEB/Q9 **2022/APR/Q4**
Click Here to See the Answer

Q5. Sketch a Main Engine air starting distributor and describe how it operates. List the safety devices and interlocks incorporated in main engine air starting system and state the purpose of each.
2020/NOV/Q6 **2020/DEC/Q2** **2021/APR/Q9** **2021/DEC/Q9** **2022/MAR/Q2** **2022/APR/Q5**
Click Here to See the Answer

Q6. With reference to turbocharger bearings:
A. Discuss the relative advantages and disadvantages of white metal sleeve and ball race bearings for turbocharger rotor support.
B. State with reasons how axial location of the rotor is achieved.
C. Explain how the bearing are kept cool in service.
D. Indicate how the bearings are sealed from the atmosphere and exhaust gas.
2020/NOV/Q2 **2021/NOV/Q3** **2022/APR/Q6**
Click Here to See the Answer

Q7. Sketch and describe the arrangement of a main engine camshaft chain. Describe the repair procedure following fracture of one chain link during operation of the engine. Give possible reasons for the failure and explain how the chain is set initially at the correct degree of tension.
2020/DEC/Q9 **2021/JAN/Q9** **2021/FEB/Q8** **2021/APR/Q5** **2021/JUL/Q9** **2021/OCT/Q1** **2021/DEC/Q5** **2022/APR/Q7**
Click Here to See the Answer

Q8. With reference to main boiler super heater arrangements:
(a) Compare the advantages and disadvantages of contra flow with parallel flow design.
(b) How the element tube bank is supported and yet allow for expansion?
(c) How boiler carryover affects super heater effectiveness?

2021/APR/Q7 **2021/DEC/Q8** **2022/MAR/Q8** **2022/APR/Q8**
Click Here to See the Answer

Q9. (a) List out the differences in the ME engine, as compared to conventional MC engine?
(b) What is the purpose of the HPS system? What is meant by the HCU-which components are included in this?
(c) Briefly explain ELFI/FIVA valve function.
(d) Describe the differences in the working of the fuel pumps (Called fuel Pressure Boosters) in ME engines, as compared to the fuel pumps of conventional engines.
2022/APR/Q9
Click Here to See the Answer

JUNE-2022

Q1. Sketch and describe a Pneumatic Control System being used on board ship for controlling temperature of
Central Cooling System.
(a) Explain what factors might lead to sluggish operation or the Controller.
(b) Explain what is Fail Safe and Fail Set in Pneumatic Control System.
(c) advantages of Pneumatic Control System over Electrical Control System
2022/JUN/Q1
Click Here to See the Answer

Q2. With reference to bridge control of a large slow speed propulsion engine.
A. How is starting and reversing achieved?
B. Investigate and suggest remedial action required if the engine,
(i) Fails to turn on air.
(ii) Turns on air but fails to fire on fuel;
(iii) Fails to reverse.
2020/DEC/Q1 **2021/FEB/Q5** **2021/APR/Q3** **2021/OCT/Q2**
2022/JAN/Q6 **2022/APR/Q3** **2022/JUN/Q2**
Click Here to See the Answer

Q3. A. Outline the problems associated with improper lubrication of the liner and piston assembly of a large slow speed engine.

B. Describe and state the causes of each of Clover leafing and Micro-seizure
C. List out the composition of a cylinder oil suitable for an engine operating on VLSFO.

2020/JAN/Q2 **2021/APR/Q2** **2021/DEC/Q2** **2022/APR/Q2** **2022/JUN/Q3**

Click Here to See the Answer

Q4. Sketch and describe the arrangement of a main engine camshaft chain. Describe the repair procedure following fracture of one chain link during operation of the engine. Give possible reasons for the failure and explain how the chain is set initially at the correct degree of tension.

2020/DEC/Q9 **2021/JAN/Q9** **2021/FEB/Q8** **2021/APR/Q5** **2021/JUL/Q9** **2021/OCT/Q1** **2021/DEC/Q5** **2022/APR/Q7** **2022/JUN/Q4**

Click Here to See the Answer

Q5. During normal engine operation, a turbocharger rapidly loses speed and the speed reduction is accompanied by appreciable noise -
A. State with reasons the possible causes.
B. Explain in detail how the engine might be safely operated if the damage caused by this incident is such that the turbocharger cannot function.
C. State with reasons the factors which may limit engine operating speed with the turbocharger out of action.

2022/JUN/Q5

Click Here to See the Answer

Q6. With reference to mechanical/hydraulic governors explain:
A. Why flyweights are driven at a higher rotational speed than the engine;
B. How dead band effects are reduced;
C. How hunting is reduced;
D. How the output torque is increased.

2020/NOV/Q8 **2022/MAR/Q5** **2022/JUN/Q6**

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Q7. Severe engine vibration has recently become evident when the main engine for which you are responsible operates within a certain speed range –

A. State, with reasons, the possible causes of such vibration;
B. State the consequences of operating the engine under such vibratory conditions;
C. Describe the procedure you, as Second Engineer, would implement in order to investigate and rectify the problem.
2022/JUN/Q7
Click Here to See the Answer

Q8. With reference to piston rings;
A. State the reasons for breakage;
B. How maintenance and engine operation could minimize breakage;
C. Explain the recent developments in the piston rings to minimize breakage;
2021/APR/Q6 **2022/JUN/Q8**
Click Here to See the Answer

Q9. With reference to main boiler super heater arrangements:
(a) Compare the advantages and disadvantages of contra flow with parallel flow design.
(b) How the element tube bank is supported and yet allow for expansion?
(c) How boiler carryover affects super heater effectiveness?
2021/APR/Q7 **2021/DEC/Q8** **2022/MAR/Q8** **2022/APR/Q8** **2022/JUN/Q9**
Click Here to See the Answer

JULY-2022

Q1. A. Describe how a crankpin bearing of a 2 stroke main propulsion engine is opened up for inspection;
B. Which half of the bearing is subject to greater wear?
C. What are the various causes of wear down of the bearing.
2020/DEC/Q6 **2022/JUL/Q1**
Click Here to See the Answer

Q2. Unit injection is being widely used in many electronically controlled engines. Describe any one such system. What are its advantage compared to the conventional systems?

2022/JUL/Q2
Click Here to See the Answer

Q3. Maine diesel engines run on the diesel cycle. With the introduction of natural gas as marine fuel, Otto cycle is also employed in some engines. Explain the difference between the two cycles and elaborate on the suitability of natural gas a fuel in such engines
2022/JUL/Q3
Click Here to See the Answer

Q4. Referring to latest developments in Turbo charger application in marine diesel engines, write short notes on
the following:-
(a) Power turbines Generators.
(b) Hybrid Turbo Chargers.
(c) Electro-assist Turbo chargers.
2022/JUL/Q4
Click Here to See the Answer

Q5. The analysis of oil may be used as a method of monitoring the condition of the equipment that it lubricates;
A. Explain briefly how shore analysts might test the oil;
B. State the type of information that would be expected;
C. Give possible reasons for an excess of: -
i. Iron, ii. Copper, iii. Antimony, iv. Tin, v. Silica.
2022/JUL/Q5
Click Here to See the Answer

Q6. Selective Catalytic Reactors (SCR) are being extensively used in marine diesel engines for the compliance of Tier-III NOx emission requirements. Explain various types of SCRs in use with particular focus one the following:-
(a) High pressure SCRs (HPSCR) Vs Low Pressure SCRs (LPSCR)
(b) SCRs with static mixers.
(c) SCRs installed upstream the turbocharger(s) Vs downstream turbochargers.
2022/JUL/Q6

Click Here to See the Answer

Q7. During morning inspection after an overnight period of UMS operation the following changes were detected:
(a) A sight but perceptible change in engine noise
(b) An alternation in engine speed.
(c) A change in exhaust temperature spread pattern.
Explain, with reasons, the possible causes of each such changes, indicating how normal operations might be restored.
2022/JUL/Q7
Click Here to See the Answer

Q8. Explain the reason, why the modern camshaft-less engines are known as intelligent engines. Describe briefly,the advantages and reliability of such an engine in comparison with the conventional marine diesel engines.
2022/JUL/Q8
Click Here to See the Answer

Q9. (a) Explain the principles behind de-rating a ship propulsion engine and the benefits. Can a derated engine be run at full power? If yes, under what conditions?
(b) Briefly explain approved procedures for de-rating of an existing propulsion engine.
2022/JUL/Q9
Click Here to See the Answer

AUG-2022

Q1. A. Explain the possible reasons T/C vibration while operating at a steady speed.
B. State how the incidence of turbo charger vibration might be minimized.
C. Explain the action to be taken in order to maintain 2 stroke engine operation in the vent of turbo
charger having to be taken out of service.
D. How is the engine operation affected when operated with a by-passed T/C
2020/OCT/Q3 **2020/DEC/Q8** **2021/MAR/Q1** **2021/SEP/Q4**
2022/AUG/Q1

Q2. (a) Sketch a sealing arrangement for an oil lubricated stern tube.
(b) Identify the common forms of seal failure.
(c) State how oil loss due to seal failure can be restricted whilst on Passage
(d) How the aft bearing is designed to minimize the concentrated load?
2022/AUG/Q2
Click Here to See the Answer

Q3. (a) Why is the axial clearance of a main thrust bearing an important dimension?
(b) How is this clearance measured?
(c) Describe how the thrust pads are removed for inspection and state what you would look for in particular.
2022/AUG/Q3
Click Here to See the Answer

Q5. With reference to LNG diesel engine installations:
(a)Describe, with the aid of a sketch, a Gas Valve Unit, explaining its purpose and indicating where it is located in the gas train.
(b) Explain why ventilation and inert gas systems must be installed with the engine fuel gas system.
(c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works
2022/AUG/Q5
Click Here to See the Answer

Q6. (a) Explain why highly efficient diesel engines tend to produce more NOx than low performance diesel engines.
(b) Describe, with the aid of a sketch, a Selective Catalytic Reduction (SCR) unit for a marine propulsion diesel engine.
(c) Explain why accurate monitoring of the exhaust gas flows entering and leaving a Selective Catalytic Reduction unit are required and how these readings are used to control the reduction chemical supplied to the SCR unit.
2022/AUG/Q6
Click Here to See the Answer

Q7. With reference to electronically controlled engines:

(a). Describe how fuel injection quantity and timing is adjusted.
(b). Describe how the exhaust valve timing may be varied.
(c). Describe how starting air valves are regulated.
2022/AUG/Q7
Click Here to See the Answer

Q8. Sketch and describe the arrangement of a main engine camshaft chain. Describe the repair procedure following fracture of one chain link during operation of the engine. Give possible reasons for the failure and explain how the chain is set initially at the correct degree of tension.
2020/DEC/Q9 **2021/JAN/Q9** **2021/FEB/Q8** **2021/APR/Q5** **2021/JUL/Q9** **2021/OCT/Q1** **2021/DEC/Q5** **2022/APR/Q7** **2022/AUG/Q8**
Click Here to See the Answer

Q9. (a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels can have on an engine crankshaft.
(b) Explain how engine deterioration influences the risk of Torsional Vibration, stating what can be done to minimise that risk.
(c) Explain TWO possible reasons for the activation of a Torsional Vibration alarm after an engine has been started if there had been no previous history of such an alarm and if no maintenance had been undertaken on the engine whilst it was stopped.
2022/AUG/Q9
Click Here to See the Answer

SEP-2022

Q1. Common rail fuel injection systems have made a comeback in marine diesel engines, the older mechanically controlled system have been replaced by electronic/hydraulic controlled system. Describe, with a line diagram any one type of a modern CR system, mentioning the engine type.
b) Compare the advantages and disadvantages of the common rail fuel injection system with the jerk type of injection system. Give examples of their use in modern diesel engines.
2022/SEP/Q1

Click Here to See the Answer

Q2. A. Explain the term Variable Injection Timing (VIT) when applied to fuel pumps and state why a change in timing of fuel injection may be required.;
B. Describe, with the aid of sketches a VIT fuel pump and explain how the change in timing is achieved whilst the pump is in operation
C. Explain how it may be determined that individual fuel pumps are injecting the correct quantity of fuel with the correct timing at a particular pump setting.
2021/APR/Q7 **2021/JUL/Q6** **2021/AUG/Q6** **2022/FEB/Q6** **2022/SEP/Q2**
Click Here to See the Answer

Q3. With reference to main Thrust bearing of the pivoting pad type, explain with sketches where necessary
a) The principle of operation of the bearing
b) The critical clearances and why they are critical?
c) How these clearances are adjusted
d) Why such bearings sometime overheat although the clearances are adequate?
e) How is the lubrication film between faces of collar and thrust pad maintained?
2022/SEP/Q3
Click Here to See the Answer

Q4. a) Describe, with the aid of a sketch, an external system for reducing engine NOx emission, explaining the chemistry of the process
b) Explain why Urea is used in the selective catalytic reduction process instead of ammonia.
(c) Explain why the exhaust gas quality must be monitored before and after the selective catalytic reduction unit, stating how such monitoring influences operation of the SCR unit.
2022/SEP/Q4
Click Here to See the Answer

Q5. a) Describe, with the aid of a sketch, the arrangement of the Gas and liquid fuel systems at the cylinder of a dual fuel 4-stroke engine, stating the input and output signals at the controller.
(b) Describe the arrangement of the gas fuel piping system used for a 4-stroke dual fuel engine with safety features incorporated.
2022/SEP/Q5
Click Here to See the Answer

Q6. Draw a line diagram of a Boiler combustion control system labelling the principal items, explain how the system functions and in particular how feed water supply, fuel supply and air/fuel ratio are regulated to match steam pressure and flow variation. Explain how these controls can be tested for alarm conditions without upsetting the balance of the system.
Click Here to See the Answer

Q7. What is meant by 'Power balancing' with respect to reciprocating engines? Why is balance desirable and how is it obtained in the case of a large marine engine? What difficulties may be experienced in balancing an engine running at about 500 R.P.M. and how can these difficulties be overcome?
Click Here to See the Answer

Q8. With reference to Main engine crankshafts:
a) Explain the term axial vibration
b) Describe, with the aid of a sketch, how axial vibration may be minimised
c) State with reasons which bearing would be most at risk due to the effects of axial vibration
d) Describe how damage to the bearing stated in part (c) may be repaired.
Click Here to See the Answer

Q9. With reference to tubular heat exchangers explain:
a) How differential movement tubes and body is accommodated when the tube plates are rigidly located in the body,
b) How and why turbulence is imparted to fluid flow through the tubes,
c) Why it has become possible to discard sacrificial anodes in sea water coolers,

d) What is meant by the term 'guided flow', with particular reference to oil heaters.
Click Here to See the Answer

OCT-2022

Q1. Explain the functional and constructional difference between the Torsional and Axial vibration dampers with the help of net sketches, Explain the function of the side and Top bracing of the main engine.
2019/AUG/Q1 **2020/MAR/Q1** **2022/OCT/Q1**
Click Here to See the Answer

Q2. a) Explain the term fuel ignition qualify and indicate how a fuel's chemical structure Influences its value
b) State, with reasons, the possible consequences of operating an engine on a fuel with a lower ignition quality than that for which it is timed.
c) (i) Explain how an engine might be adjusted to burn fuel of different ignition quality.
(ii) State what checks can be carried out in order to determine that the engine is operating correctly.
Click Here to See the Answer

Q3. What is slow steaming & how it's achieved without engine modification? Enumerate various operational issues with slow steaming. How such operational issues can be dealt with?
Click Here to See the Answer

Q4. Selective catalytic Reactors (SCR) are being extensively used in marine diesel engines for the compliance of Tier-III NOx emission requirements. Explain various types of SCRs in use with particular focus on the following:-
a) High-Pressure SCRs (HPSCR) vs Low-Pressure SCRs (LPSCR)
b) SCRs with static mixers.
c) SCRs installed upstream the turbocharger(s) Vs downstream turbochargers.
2022/JUL/Q6 **2022-OCT/Q4**
Click Here to See the Answer

Q5. With reference to the behavior of fabricated bed plates & frames in service:
(a) Identify the various forces imposed simultaneously upon them.
(b) Explain how engine structure withstands these forces?
(c) State how these forces are transferred to ship structure?
2022/OCT/Q5
Click Here to See the Answer

Q6. Electronically controlled marine diesel engines are said to provide advantages over the traditional engines in the following areas
a) Improved fuel economy
b) Emission control
c)Engine response during manoeuvring, especially crash movements.
Explain how these are achieved
Click Here to See the Answer

Q7. a) State, with reasons, three properties required of a crankcase oil which is to be used for a trunk piston main engine
b) Explain how a representative sample of crankcase oil would be obtained from a trunk piston engine
c) Briefly describe the action to be taken if the crankcase oil cannot immediately be replaced and analysis show:
i)Water is present
ii)Alkalinity has fallen
iii)Viscosity has changed appreciably
iv)Carbon content has increased.
2020/FEB/Q7 **2022/OCT/Q7**
Click Here to See the Answer

Q8. a) To improve the power-to-weight ratio of an engine, it is necessary to increase the mep. Discuss the importance of turbocharger compression ratio in this regard. Why has it become necessary to introduce two-stage turbocharging?
b) With reference to turbochargers with variable turbine area, explain
i)Which area is varied
ii)Why is it varied

iii)How is it varied.
Click Here to See the Answer

Q9. With respect to the refrigeration system on board vessels, answer the following
a) Why are some TEVs fitted with an external equalising connection?
b) What is the purpose of a back pressure valve. what will the effect if it leaks?
c)How does an electronic TEV function.
Click Here to See the Answer

NOV-2022

Q1. Crankcase oil mist detectors have undergone a lot of changes in recent years. Compare the modern types with multiple sensor units with the traditional single sensor type, where sampling was done sequentially. What is meant be addressable sensors.
2022/NOV/Q1
Click Here to See the Answer

2.a) With the aid of a block diagram describe the operation of an electronic governor fitted to a main engine
b) An engine fitted with an electronic governor behaves erratically during load changes. Explain the possible causes
c) Describe a device fitted in order to safeguard an engine in the event of sudden and complete removal of its load
2022/NOV/Q2
Click Here to See the Answer

Q3. (a) Explain the principles behind de-rating a ship propulsion engine and the benefits. Can a derated engine be run at full power? If yes, under what conditions?
(b) Briefly explain approved procedures for de-rating of an existing propulsion engine.
2022/JUL/Q9 **2022/NOV/Q3**
Click Here to See the Answer

Q4. Explain each of the following:
A. Why wear down in main bearings is critical to the condition of the crankshaft and propeller shaft system.
B. Why total reliance is placed on frictional grip in conventional built up crankshaft
C. Why hole oils are given large fillets in crankpin and journals.
Click Here to See the Answer

Q5. A. Briefly describe any one of the manufacturing process involved in semi built or welded construction of crankshaft of large marine engine; B. Give a composition of material used; C. Draw a stress diagram for stress in web of a crankshaft.
2022/NOV/Q5
Click Here to See the Answer

Q6. Express your reactions and state the subsequent investigation you would make if a laboratory report on a used diesel engine oil sample indicated the presence of appreciable amounts of: -
A. Iron; B. Copper, C. Antimony and Tin; D. Silicon; E. n-pentane and toluene insoluble
2022/NOV/Q6
Click Here to See the Answer

Q7. Evaluate the influence of the following factors upon cylinder and piston ring wear rates;
A. Position of rings in relation to piston crown;
B. Spread and proximity of coolant passages from liner wall;
C. Flow rate and specific heat of coolant; D. Chromium plating of ring faces.
2022/NOV/Q7
Click Here to See the Answer

Q8. With respect to VIT in fuel injection give your comments on the following statements.
a) By using VIT 100% peak pressure is achieved at 85% rpm. Thus 100% power is achieved at 85% rpm. This results in fuel saving.

b) VIT is not possible nor used in alternator engines as they run at constant rpm.
c) Breakpoint is the point at which maximum break horsepower is achieved.
d) VIT system can ensure the correct Pmax is achieved irrespective of the fuel used.
e) Electronically controlled engines do not have VIT.

2022/NOV/Q8

Click Here to See the Answer

Q9. NOx Tire – III requirements are getting mandatory as per MARPOL Annex IV. IN this context, briefly explain the following: -
a) Working principles and Components in a SCR system.
b) Operational sequence of a NOx control SCR plant.
c) Operational difficulties in SCR systems.

2022/NOV/Q9

Click Here to See the Answer

DEC- 2022

Q1. With reference to an engine air starting system
(a) Explain why a slow turning is fitted
(b) State, with reasons, when a slow turning system operates
(c) Describe, with the aid of a sketch, an air starting system, explaining how the slow turning system operates.

2022/DEC/Q1

Click Here to See the Answer

Q2. With reference to LNG diesel engine installations:
(a)Describe, with the aid of a sketch, a Gas Valve Unit, explaining its purpose and indicating where it is located in the gas train.
(b) Explain why ventilation and inert gas systems must be installed with the engine fuel gas system.
(c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works

2022/AUG/Q5 **2022/DEC/Q2**

Click Here to See the Answer

Q3. State, with reasons, THREE properties required for a cylinder lubricant for a main engine operating on HFO.
(b) Describe, with the aid of a sketches, an electronically controlled cylinder lubrication system, stating how the timing and quantity of cylinder lubricant is regulated and set.
2022/DEC/Q3
Click Here to See the Answer

Q4. Selective catalytic Reactors (SCR) are being extensively used in marine diesel engines for the compliance of Tier-III NOx emission requirements. Explain various types of SCRs in use with particular focus on the following:-
a) High-Pressure SCRs (HPSCR) vs Low-Pressure SCRs (LPSCR)
b) SCRs with static mixers.
c) SCRs installed upstream the turbocharger(s) Vs downstream turbochargers.
2022/JUL/Q6 **2022/OCT/Q4** **2022/DEC/Q4**
Click Here to See the Answer

Q5. (a) Explain the term torsional vibration, indicating the effect this can have on an engine crankshaft.
(b) Explain why a detuner/vibration damper might be fitted to an engine.
(c) Explain why an engine might have a barred speed range and why the engine should not be operated continuously in that range. (5)
2022/DEC/5
Click Here to See the Answer

Q6. (a) Describe, with the aid of sketches, the procedure for cutting out and "hanging-up" an engine cylinder of a two-stroke crosshead engine in the event of complete failure of the crosshead pin such that the crosshead pin cannot be operated and no replacement is immediately available. (12)
(b) State, with reasons, the factors which may inhibit starting and limit the operating speed of the engine with a cylinder cut out. (4)
2022/DEC/Q6
Click Here to See the Answer

Q7. With reference to a waste heat boiler/economiser:

a. Write a procedure for the cleaning the gas side of an exhaust gas boiler/economiser when the associated main engine is:
(i) running; (ii) stopped.
b. Write a procedure for operation of the main engine when the associated waste heat boiler/economizer cannot be operated due to tube failure.

2022/DEC/Q7

Click Here to See the Answer

Q8. a. Explain why top bracing is used for large crosshead engines. (4)
b. Describe, with the aid of a sketch, a hydraulic top bracing unit for a large crosshead engine indicating where the top bracing is fitted and how it operates. (6)
C. Write instructions for the checking of a large crosshead engine top bracing system and a holding down system. (6)

2022/DEC/Q8

Click Here to See the Answer

Q9. (a) Explain why variable exhaust valve closing can be advantageous in the operation of large slow speed main engines.
(b) Explain, with the aid of a sketch, how variable exhaust valve closing is achieved.
(c) Explain how high impact is avoided as the valve closes. (2)

2022/DEC/Q9

Click Here to See the Answer