D. MARINE
Study Material

# MEO CLASS 2 WRITTEN: EKM

## (ENGINEERING KNOWLEDGE MOTOR)

### FOR INDIAN COMPETENCY EXAM

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Study Material

# JAN-2025

1. 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 describes 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. (16)

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| 2021/MAR/07 | 2022/MAR/07 | 2023/DEC/06 | 2025/JAN/01 |

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2. With regards to modern 4-stroke diesel engine explain the following. a) The function of
protection ring installed on the upper part of liner. b) The moderation in fuel injection drive system compared to conventional 4-stroke engine. c) Staggering of layout for multi hole nozzles. d) Effect of swirl and squish during the combustion process and how swirl and squish is generated (16)

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| 2018/JUN/05 – | 2023/JAN/05 – | 2025/JAN/02 | |

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3. With respect to the refrigeration system on board vessels, answer the following
a) Why are some TEVs fitted with an external equalizing connection? (6)
b) What is the purpose of a back pressure valve. what will the effect if it leaks? (5)
c) How does an electronic TEV function

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| 2023/JUL/07 | 2023/SEP/06 | 2023/NOV/04 | 2024/OCT/07 |

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4. Electronically controlled marine diesel engines are said to provide advantages over the traditional engines in the following areas
a) Improved fuel economy (6)
b) Emission control(5)
c) Engine response during manoeuvring, especially crash movements. Explain how these are achieved.

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| 2022/OCT/06 | 2025/JAN/04 | |

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5. With reference to main Thrust bearing of the pivoting pad type, explain with sketches where necessary
a) The principle of operation of the bearing (16)
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?

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| 2025/JAN/05 |

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6. It is common practice to plot in a graphical form the wear of a cylinder liner against the number of hours it has been in operation. When this is done it is often noticed that some scatter exists between the plotted points after a few wear figures have been recorded. What is the reason for the scatter and how can the wear rate be shown in a more acceptable form? How would you forecast the length of life for a cylinder liner? (16)

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| 2025/JAN/05 | |

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7. a) Describe, with the aid of a sketch, an external system for reducing engine NOx emission, explaining the chemistry of the process (6)
bj Explain why Urea is used in the selective catalytic reduction process instead of ammonia. (5)
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. (5)

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8.a) Explain how static and dynamic imbalance of crankshafts can be overcome.
b) Discuss the methods employed to obtain primary, reciprocating balance in an engine and explain why they are not completely successful
(5)
c) Describe engine additions which may be fitted to overcome problems resulting from primary or secondary Imbalance (6)

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| 2011/DEC/07 – | 2025/JAN/08 | | |

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9.a) Define the following conditions relating to lubricating oil
(6) Oxidation
(ii) Emulsification
(iii) Acidity
b) Explain how each of the conditions in Q3 (a) is controlled by maintenance (5)
c)Suggest possible consequences if the conditions in Q3 (a) change and no corrective action is taken.

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| 2025/JAN/09 | |

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## FEB-2025

1. What is the meaning of "de-rating "of machinery?
a) Explain the principles behind de- rating a ship propulsion engine as a retro fit. And the benefits. (8)
b) Can a de-rated engine be run at full power? If yes, under what conditions? (8)

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2.a) Explain fatigue cracking, stating its causes and propagation. (8)
b) Explain, how poor maintenance and engine overload may contribute to the risk of fatigue cracking of cylinder head holding studs. (8)

**2022/FEB/03** **2022/MAR/06** **2025/FEB/02**

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3.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. (16)

**2023/DEC/03** **2025/FEB/03**

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4. Periodical Lubricating Oil Analysis, its correct interpretation and corrective measures are of critical significance for the maintenance of marine machineries. With reference to the modern analysis techniques employed for

the condition of L.O, discuss the following:
a) Elemental (Spectrometric) Analysis
b) Fourier Transform Infrared (FTIR) Spectroscopy
c) Particle Count
d) Base Number Vs Acid Number (16)
**2022/MAR/02** **2023/MAR/09** **2024/JUN/09**
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5. 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 in the gas train. (6)
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?
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6. a) Sketch a typical power indicator card for a slow speed marine diesel engine. (8)
b) Explain how the card may be used to assess the power developed in the Cylinder. (8)
**2022/JAN/03** **2025/FEB/06**
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7.With reference to behavior of fabricated bed plates and frames in services:
a) Identify various forces imposed simultaneously upon them. (6)
b) Explain how engine structure withstands these forces. (5)
c) State how these forces are transferred to ship's structure. (5)
**Click Here to See the Answer**
8. 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? (16)
**2024/AUG/09** **2025/FEB/08**
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9.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? (8)
b) With reference to turbochargers with variable turbine area, explain. (8)
i) Which area is varied
ii) Why is it varied
iii) How is it varied
**2023/JUN/01** **2025/FEB/09**
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## MARCH -2025

1.With reference to main engine tie rod explain.
a). Function (3)
b) Effect on main engine in case slack(3)
c) Identifying slackness(3)
d)Material(4)
e) Tightening procedure
**2025/MAR/01**
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2 a) State, with reasons, the properties required for a cylinder lubricant for a main engine operating on HFO. (8)
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 (8)
**2025/MAR/02**
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3. a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels can have on an engine crankshaft (6)
b) Explain how engine deterioration influences the risk of Torsional Vibration, stating what can be done to minimise that risk. (5)
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. (5)
**2024/AUG/01** **2025/MAR/03**
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4. 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.(6)
c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works

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5. a) Identify the factors, which could be responsible for initiation and propagation of explosions in air starting systems. (4)
b) Explain how the possibility of an explosion in an air start system is minimized
c)Describe the devices required for air start systems, which are intended to dissipate the energy of an explosion.
d) Suggest why one type of safety addition, although appearing to operate correctly, may not prevent a severe air start line explosion and loss of life. (4)

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6. Give a list of the properties or test by which distillate and blended fuels may be specified or decisions be made on their fitness for use. Name the properties or constituents that may be found in a blended fuel having a high viscosity and high carbon content. Explain how they may cause problems in engine operation (16)

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7. Evaluate the influence of the following factors upon cylinder and piston ring wear rates (16)
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/07** **2025/MAR/07**

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8 a) (i) Describe with the aid of a sketch, one section of a large slow speed engine crankshaft which has been assembled by shrinkage of webs onto journal pins (4)
(ii) Explain how a five degree twist might be caused to a shaft assembled by shrinkage (4)

b) State the possible effects of a five-degree twist in the crankshaft assembly and draw conclusions as to whether the engine should be operated and any adjustments that may be necessary for continued operation Assume that the incident has occurred at a port with no repair facilities. (8)

**2025/MAR/08**

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9 a) Why is the axial clearance of a main thrust bearing an important dimension? (5)

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 (6)

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## APRIL-2025

Q.1 Sketch and show all parts of a two-stroke engine stuffing box. Describe the procedure of overhauling a two-stroke engine stuffing box, without removing the piston. Answer should include all safety precautions and necessary tools used for stuffing box overhaul. (16)

**2022/JAN/09** **2022/FEB/02** **2024/AUG/01**

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Q.2NOx Tier - III requirements are getting mandatory as per MARPOL Annex VI. In this context, briefly explain the following:

a) Working principles and Components in an SCR system (6)

b) Operational sequence of a NOx control SCR plant. (5)

c) Operational difficulties in SCR systems. (5)

**2022/NOV/09**

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Q.3 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: (16) A. Iron; B. Copper; C. Antimony and Tin; D. Silicon; E. n-pentane and toluene insoluble.

**2022/NOV/06**

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Q.4(a) Describe the different types of crankshafts used in marine diesel engines. Highlight their constructional features, materials used, and typical applications. (8)
(b) Compare the advantages and disadvantages of semi-built and solid forged crankshafts with respect to strength, repairability, manufacturing process, and suitability for different engine sizes. (8)
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Q.5a) Describe the actions and checks required to ensure that a crosshead main propulsion engine may be operated in a slow steaming condition. (8)
b) Explain the problems which may arise during a prolonged period of slow steaming. (4)
c) Explain what actions should be taken before and after the engine is returned to normal operation after a period of slow steaming. (4)
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Q.6a) Explain the need for a moment compensator in large two-stroke marine engines. With the help of a neat sketch, describe the construction and working principle of a moment compensator. (10)
(b) Discuss the consequences of failure or incorrect functioning of the moment compensator in a two-stroke engine. What checks and maintenance practices are recommended to ensure its reliability? (6)
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Q.7a) Define Specific Cylinder Lubricating Oil Consumption (SCLOC) in a two-stroke marine diesel engine. Derive the formula for SCLOC and explain the procedure for calculating it during normal engine operation. (10)
(b) Discuss the factors affecting SCLOC and explain the procedures adopted onboard to optimize cylinder oil consumption. Include methods used for monitoring and adjusting the cylinder lubrication system. (6)
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Q.8 With regards to modern diesel engine raising the Life Cycle Value (LCV), describe the importance of following: (16)
a) Low Sac Volume of Fuel Injection Valve
b) Fuel Valve opening Pressure regulation
c) Contamination of combustion Chamber and impact on LCV
d) Contamination of lube oil and impact on LCV.
**2023/NOV/04**
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Q.9 With reference to Modern Diesel Engine describe the features of High-pressure Miller cycle and discuss the following: (16)
a) Reduction in Air Temperature due to Miller Cycle
b) Recovery of Pressure in the Combustion chamber during the Miller cycle
c) Effect of Miller Cycle on specific fuel consumption and NOX emission.
d) The impact on various parameters during low load operation using Miller Cycle.
**2023/NOV/03**
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## JUNE-2025

Q.1What is the meaning of "de-rating" of machinery?
a) Explain the principle behind de-rating a ship propulsion engine as a retro fit and the benefits. (8)
b) Can a de-rated engine be run at full power? If yes, under what conditions? (8)
**2025/FEB/01** **2025/JUN/01**
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Q.2a) Explain fatigue cracking, stating its causes and propagation. (8)
b) Explain how poor maintenance and engine overload may contribute to the risk of fatigue cracking of cylinder head holding studs. (8)
**2022/FEB/03** **2022/MAR/06** **2025/FEB/02** **2025/JUN/02**
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Q.3Sketch and describe the types of combustion cycles. Explain the application of each cycle with advantages and disadvantages. (16)
**Click Here to See the Answer**

Q.4 Periodical Lubricating Oil Analysis, its correct interpretation and corrective measures are of critical significance for the maintenance of marine machinery. With reference to the modern analysis techniques employed for the condition of L.O., discuss the following: (16)
a) Elemental (Spectrometric) Analysis
b) Fourier Transform Infrared (FTIR) Spectroscopy
c) Particle Count
d) Base Number vs Acid Number
**2022/MAR/02** **2023/MAR/09** **2024/JUN/09**
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Q.5 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 in the gas train. (6)
b) Explain why ventilation and inert gas systems must be installed with the engine fuel gas system. (5)
c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works. (5)
**2025/FEB/05** **2022/AUG/05** **2025/MAR/04** **2025/JUN/05**
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Q.6a) Briefly state and describe the various heat treatment processes applied to cast iron main engine components. (4)
b) How do these treatments modify the microstructure and mechanical properties of the components? (6)
c) Provide examples of how heat treatment can improve wear resistance, strength, and service life in main engine parts. (6)
**2025/JUN/06**
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Q.7 With reference to behavior of fabricated bed plates and frames in service:
a) Identify various forces imposed simultaneously upon them (6)

b) Explain how engine structure withstands these forces (5)
c) State how these forces are transferred to ship's structure (5)
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Q.8 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? (16)
**2024/AUG/09** **2025/FEB/08** **2025/JUN/08**
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Q.9 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? (8)
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
**2022/OCT/08** **2023/JUN/01** **2025/FEB/09** **2025/JUN/09**
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## JULY-2025

1. With Respect to a turbocharged 2-Stroke Main Propulsion Diesel Engine
a. What is the purpose of Auxiliary Blower.
b. What are the safeties provided for the scavenge air receiver.
c. Why do we require scavenge air cooler?
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2. With reference to the burning of heavy residual fuel in the main engine:
(a) State with reasons FOUR modifications which need to be made as compared with the same engine burning distillate fuels.
(b) State with reasons SIX properties you would require to see in the specification for residual fuel indicating the effect EACH of these properties might have with respect to the storage and burning of the fuel.

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2024/JUL/03

3.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.

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4.a) Enumerate the causes of vibration in diesel machinery and shafting.
b) Describe procedures by which it may be reduced by operating personnel, suitable design and devices.
c) State the possible effects of vibration on machinery and crewmembers

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2024/JUL/04 2025/JUL/04

5.a) Describe how propeller shaft/stern bearing clearance is measured.
b) Identify with reasons the major factors which substantially determine the range of permissible clearance.
c) State with reasons what parts of propeller shafts should receive particularly close inspection upon withdrawal of such shafts for survey.
d) State why some propeller shafts require less frequent inspection than others.

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2024/JUL/05 2025/JUL/05

6.Sketch and show all parts of a two-stroke engine stuffing box. Describe the procedure of overhauling two stroke engine stuffing box, without removing piston. All safety precautions and proper tools used for overhaul to be mentioned.

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2022/JAN/09 2022/FEB/02 2024/AUG/01 2025/JUN/01 2025/JUL/06

7.a) What is the purpose of the main thrust bearing?

b) When checking the main thrust bearing, what dimensional checks would be necessary?
c) How is a thrust bearing cooled?
d) Describe, with a sketch, the special chocking arrangements normal to thrust bearing.
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**2024/JUL/07** **2025/JUL/07**

8. 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.
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**2022/DEC/01** **2023/SEP/02** **2024/SEP/02** **2025/JUL/08**

9.a) Explain why top bracing is used for large crosshead engines.
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.
c) Write instructions for the checking of a large crosshead engine top bracing system and a holding down system.
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**2022/DEC/08** **2024/SEP/03** **2024/SEP/03**

## AUG-2025

1. With respect to a turbo-charging a 2-stroke main propulsion diesel engine:
(a) What is the purpose of auxiliary blower?
(b) What are the safeties provided for the scavenge air receiver?
(c) Why do we require scavenge air cooler?
**Click Here to See the Answer**

2. With respect to a 2-stroke main propulsion diesel engine draw and explain the following
(a) How the various sections of exhaust manifold connected together for the main engine?
(b) What is the arrangement for thermal expansion of different sections of the manifold?
(c) What is the arrangement in the exhaust manifold to prevent broken pieces of piston rings entering turbine of the T/C?
**2025/AUG/02**
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3. Why is it necessary to cool the cylinder head covers and cylinder liners and pistons of slow and medium speed engines? What are the different cooling mediums used for cooling slow and medium speed Engines explain with reasons?
**2025/AUG/02**
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4. 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 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?
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5. While operating at Sea during rough weather conditions, fire sparks have been observed coming out from the funnel of your vessel. On investigation, it has been observed that the fuel contains considerable quantity of water and sludge. As the Second engineer of the vessel. Explain:
a. Immediate actions taken to rectify the problem
b. Precautions you take to avoid recurrence of this type of problem. (8)
**2019/NOV/08** **2019/DEC/04** **2025/AUG/05**

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6. With respect to Air Starting systems for 2 stroke diesel engines:
(a) Sketch and describe Main Engine starting air distributor.
(b) List the safety devices and interlocks incorporated in main engine air starting system and state the purpose of each.
**2021/MAR/09** **2022/JAN/05** **2025/AUG/06**
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7. With Respect to Main Engine Turbochargers:
(a) Explain why cleanliness throughout the turbochargers system is critical to engine performance.
(b) Describe an in-service cleaning procedure for gas and air sides of a turbocharger indicating safety precautions to be observed.
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8. State the probable engine defects and rectifying action needed if the following conditions are indicated on a single unit of a large two-stroke marine diesel engine having seven units. State any additional information which might be of help in forming an opinion.
(a) Increased exhaust temperatures.
(b) Reduced exhaust temperature.
(c) Reduction in jacket cooling water outlet temperature.
(d) Increase in jacket cooling water return temperature.
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9.a) To improve the power-to-weight ratio of an engine, it is necessary to increase the Mean effective pressure. 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

**2022/OCT/08** **2023/JUN/01** **2025/FEB/09** **2025/JUN/09** **2025/AUG/09**

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## SEP-2025

1.(a) Explain the possible reasons of Main Engine T/C vibration while operating at a steady speed.
(b) State how the Incidence of turbo charger vibration might be minimised
(c) Explain the action to be taken in order to maintain 2 stroke engine operation in the event of a turbo charger having to be taken out of service
(d) How is the engine operation affected when operated with a by-passed T/C

**2023/NOV/09** **2025/SEP/01**

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2(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/02** **2025/SEP/02**

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3.(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/03** **2023/JUL/03** **2025/MAR/09** **2025/SEP/03**

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4. Describe a three-element feed water controller (i.e regulator) measuring steam flow, drum level and feed water flow and explain how a unity relationship is maintained between the three variables.

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5. 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/DEC/02** **2025/FEB/05** **2022/AUG/05** **2025/MAR/04** **2025/JUN/05** **2025/AUG/04** **2025/SEP/05**
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6. (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.
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7. 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.
**2024/MAR/07**
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8. 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.
**2022/NOV/02** **2024/SEP/05** **2025/FEB/03**
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9. (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 minimize 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.

**2023/JUL/01** **2023/DEC/09**

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## OCT-2025

Q1.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

**2022/NOV/02**

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Q2. 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.

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Q3. (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/DEC/05** **2023/SEP/01**

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Q4. 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/DEC/02** **2025/FEB/05** **2022/AUG/05** **2025/MAR/04** **2025/JUN/05** **2025/AUG/04** **2025/SEP/05**

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Q5.a) Identify the factors, which could be responsible for initiation and propagation of explosions in air starting systems. (4)
b) Explain how the possibility of an explosion in an air start system is minimized. (4)
c) Describe the devices required for air start systems, which are intended to dissipate the energy of an explosion. (4)
d) Suggest why one type of safety addition, although appearing to operate correctly, may not prevent a severe air start line explosion and loss of life. (4)

**2025/MAR/05**

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Q6. Give a list of the properties or test by which distillate and blended fuels may be specified or decisions be made on their fitness for use. Name the properties or constituents that may be found in a blended fuel having a high viscosity and high carbon content. Explain how they may cause problems in engine operation. (16)

**2024/OCT/03** **2025/MAR/06**

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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.
**2021/MAR/06** **2021/JUL/08** **2022/JAN/07** **2017/APR/09** **2017/JAN/09** **2024/JUN/08**
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Q8. a) Briefly describe the causes and effects of bacterial attack of lubricating oil.
b) Bacterial activity has been detected in the lubricating oil of the main engine fitted in the ship aboard which you are serving as 2ndeng. Write a letter to the owner/operator of the ship indicating the action you intent to take and offer suggestion to the avoidance of future incidents.
**2019/APR/03** **2020/OCT/04** **2016/DEC/03** **2015/MAR/05**
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Q9. (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.
(16)
**2022/AUG/03** **2023/JUL/03** **2025/MAR/09** **2025/SEP/03**
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## NOV-2025

Q.1. Crankshaft of a 2-stroke engine goes through several types of stresses during the operation of the engine. Explain these types of stresses and possible effect of them on the crank shaft and how are these stresses taken care of in the crankshaft.
(16)
**Click Here to See the Answer**

Q.2 With regards to modern 4-stroke diesel engine explain the following.
a) The function of protection ring installed on the upper part of liner.
b) The moderation in fuel injection drive system compared to conventional 4-stroke engine.
c) Staggering of layout for multi hole nozzles.
d) Effect of swirl and squish during the combustion process and how swirl and squish is generated
(16)
**Click Here to See the Answer**

Q.3 With respect to the refrigeration system on board vessels, answer the following
a) Why are some TEVs fitted with an external equalising connection? (6)
b) What is the purpose of a back pressure valve. what will the effect if it leaks?(5)
c)How does an electronic TEV function.(5)
**Click Here to See the Answer**

Q.4. Electronically controlled marine diesel engines are said to provide advantages over the traditional engines in the following areas
a) Improved fuel economy (6)
b) Emission control (5)
c)Engine response during maneuvering, especially crash movements. Explain how these are achieved. (5)
**2022/OCT/06** **2025/JAN/04**
**Click Here to See the Answer**

Q,5. With reference to main Thrust bearing of the pivoting pad type, explain with sketches where necessary -(16)
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/03** **2025/JAN/05**

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Q.6. It is common practice to plot in a graphical form the wear of a cylinder liner against the number of hours it has been in operation. When this is done it is often noticed that some scatter exists between the plotted points after a few wear figures have been recorded. What is the reason for the scatter and how can the wear rate be shown in a more acceptable form? How would you forecast the length of life for a cylinder liner?
(16)

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**2025/JAN/06**

7.a) Describe, with the aid of a sketch, an external system for reducing engine NOx emission, explaining the chemistry of the process (6)
b) Explain why Urea is used in the selective catalytic reduction process instead of ammonia. (5)
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. (5)

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**2022/SEP/04** **2023/AUG/05** **2025/JAN/07**

Q.8.a) Explain how static and dynamic imbalance of crankshafts can be overcome. (5)
b) Discuss the methods employed to obtain primary, reciprocating balance in an engine and explain why they are not completely successful. (5)
c) Describe engine additions which may be fitted to overcome problems resulting from primary or secondary imbalance. (6)

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**2025/JAN/08**

Q.9. (a) Cast Iron welding is a challenging task, give reasons. (8)
(b) What alternative repair methods were employed by engine makers on a cast iron casing of an engine? (8)
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