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 - 2026

1. With reference to Cylinder Liner lubrication of large two stroke engines.
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 cloverleafing, and micro-seizure
c) List out the composition of a cylinder oil suitable for an enginelaperating on residual fuel

2026/JAN/01

Click Here to See the Answer

2.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 Fails to turn on air
Tums on air but fails to fire on fuel in Fails to reverse

2022/JAN/06 **2022/APR/03** **2022/JUN/02** **2023/MAR/08** **2024/JUN/06**

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3. 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 swirt and squish is generated

2023/JAN/05 **2025/JAN/02** **2025/NOV/02** **2026/JAN/01**

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4. 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.

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5. With reference to piston rings:
(a) State reasons for breakage
(b) How maintenance and engine operation could minimize breakage?
(c) Explain the possible Cori sequences with respect to performance and safety of piston rings. operating the engine with broken or severely worn pisti
2022/JAN/04 **2024/JUN/09**
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6.a) Explain how static and dynamic imbalance of crankshafts can be overcome. reciprocating balance in an engine and b) Discuss the methods employed to obtain ain primary, reci explain why they are not completely successful
c) Describe engine additions which may be fitted to overcome problems resulting from primary or secondary imbalance. (6)
2025/JAN/08 **2025/NOV/08** **2026/JAN/06**
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7.a) Cast iron welding is a challenging task, give reasons
(b) What alternative repair methods were employed by engine makers on a cast iron casing of an engine?
2026/JAN/07
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8.a) Sketch a sealing arrangement for an oil lubricated stem 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** **2026/JAN/08**
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9. With respect to respect to fuel injection system of diesel engines,
(a) What is the purpose of VIT?
(b) How is the end of injection controlled in a 2 stroke propulsion engine and 4 stroke medium speed auxiliary engine? (6)
(c) Explain the purpose of a draw card.

2026/JAN/08
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FEB-2026

1. With reference to Cylinder Liner lubrication of large two stroke engines:(16)
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 cloverleafing, and micro-seizure
c) List out the composition of a cylinder oil suitable for an engine operating on residual fyel. (16)
2026/JAN/01 **2026/FEB/01**
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2. With reference to bridge control of a large slow speed propulsion engine:
a) How is starting and reversing achieved?
b) Investigate and suggest rSemedial 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
2023/MAR/08 **2024/JUN/06** **2026/JAN/02** **2026/FEB/02**
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3. 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)
2023/JAN/05 **2025/JAN/02** **2025/NOV/02** **2026/JAN/03** **2026/FEB/03**
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4.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.
2023/JUL/01 **2023/DEC/09** **2025/SEP/08** **2026/JAN/04** **2026/FEB/04**
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5. With reference to piston rings:
(a) State reasons for breakage. (16)
(b)How maintenance and engine operation could minimize 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/04 **2022/JAN/04** **2016/JUL/09** **2024/JUN/09** **2026/JAN/05** **2026/FEB/05**
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6.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)
2025/JAN/08 **2025/NOV/08** **2026/JAN/06** **2026/FEB/06**
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7. (a) Cast Iron welding is a challenging task, give reasons.
(b) What alternative repair methods were employed by engine makers on a cast iron casing of an engine? (8)
Click Here to See the Answer

8. (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** **2026/JAN/08** **2026/FEB/08**

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9. a) Sketch and explain a fuel injection pump capable of variable injection timing. (10)

b) Explain how the fuel injection pump sketched in part a) changes the timing and quantity of fuel injection.

2021/APR/07 **2021/AUG/06** **2022/FEB/06** **2022/SEP/02** **2023/JAN/09** **2023/AUG/01**

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MAR-2026

Q1. 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. Answer should include all safety precautions and necessary tools used for stuffing box overhaul. (16)

2021/FEB/Q1 **2023/DEC/Q7** **2024/JUL/Q6** **2025/APR/Q1** **2025/JUL/Q6** **2026/MAR/Q1**

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Q2. Auxiliary engine components often face demanding service conditions. Analyse how the addition of alloying elements (such as silicon, chromium, and manganese) to cast iron influences the corrosion resistance, hardness, and thermal stability of these parts. Provide examples of auxiliary engine components that benefit from such alloying. (16)

2026/MAR/Q2

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Q3. Express your reactions and state the subsequent investigation you would make if a laboratory report on a used diesel engine lubricating 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/Q6 **2025/APR/Q3** **2026/MAR/Q3**

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Q4. With reference to Crankshafts used in Marine Diesel Engines:
(a) Describe the different types of crankshafts and 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)
2025/APR/Q4 **2026/MAR/Q4**
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Q5. a) 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)
2023/JUL/Q4 **2025/APR/Q5** **2026/MAR/Q5**
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Q6. (a) 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)
2025/APR/Q6 **2026/MAR/Q6**
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Q7. a) 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 procedure adopted onboard to optimize cylinder oil consumption. Include methods used for monitoring and adjusting the cylinder lubrication system. (6)
2025/APR/Q7 **2026/MAR/Q7**

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Q8. 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/Q4 **2025/APR/Q8** **2026/MAR/Q8**
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Q9. With reference to Crankshaft deflections:
(a) Explain why crankshaft deflections are taken. (4)
(b) Write a procedure for the taking of main engine crankshaft deflections.
(c) Explain the action to be taken if some crankshaft deflection readings are outside acceptable limits. (4)
2023/OCT/Q2 **2026/MAR/Q9**
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APR -2026

Q1. a) Explain the possible reasons of Main Engine T/C vibration while operating at a steady speed. (4)
b) State how the incidence of turbo charger vibration can be minimized. (4)
c) Explain the action to be taken in order to maintain 2 stroke – engine operation in the event of a out of service turbo charger. (4)
d) How is the engine operation affected when operated with a by-passed T/C (4)
2021/MAR/Q1 **2021/SEP/Q4** **2022/AUG/Q1** **2023/NOV/Q9** **2025/SEP/Q1** **2026/APR/Q1**
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Q2. a) Sketch a sealing arrangement for an oil lubricated stern tube. (7)
(b) Identify the common forms of seal failure. (3)
(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? (3)

2022/AUG/Q2 **2025/SEP/Q2** **2026/APR/Q2**
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Q3. a) Why is the axial clearance of a main thrust bearing an important dimension? (6)
(b) How is this clearance measured? (4)
(c) Describe how the thrust pads are removed for inspection and state what you would look for in particular. (6)
2022/AUG/Q3 **2023/JUL/Q3** **2025/MAR/Q9** **2025/SEP/Q3** **2025/OCT/Q9** **2026/APR/Q3**
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Q4. With reference to waste heat recovery systems used on-board ships:
(a) Describe, with the aid of a sketch, a waste heat recovery system for electrical generation using main engine exhaust gas in combined gas/steam turbine systems. (8)
(b) Describe the operation of the waste heat recovery system described in part (a) whilst the associated main engine is running. (8)
2026/APR/Q4
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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. (8)
(b) Explain why ventilation and inert gas systems must be installed with the engine fuel gas system. (4)
(c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works. (4)
2022/AUG/Q5 **2022/DEC/Q2** **2025/FEB/Q5** **2025/MAR/Q4** **2025/JUN/Q5** **2025/AUG/Q4** **2025/SEP/Q5** **2025/OCT/Q4** **2026/APR/Q5**
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Q6.a) Explain why highly efficient diesel engines tend to produce more NOx than low performance diesel engines. (5)
(b) Describe, with the aid of a sketch, a Selective Catalytic Reduction (SCR)

unit for a marine propulsion diesel engine. (6)
(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. (5)
2022/AUG/Q6 **2023/FEB/Q1** **2023/OCT/Q6** **2023/DEC/Q2** **2024/JUL/Q8** **2025/SEP/Q6** **2026/APR/Q6**
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Q7. With reference to electronically controlled engines:
(a) Describe how fuel injection quantity and timing is adjusted. (6)
(b) Describe how the exhaust valve timing may be varied. (5)
(c) Describe how starting air valves are regulated. (5)
2022/AUG/Q7 **2024/MAR/Q7** **2025/SEP/Q7** **2026/APR/Q7**
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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. (16)
2020/DEC/Q9 **2021/JAN/Q9** **2021/FEB/Q9** **2021/APR/Q5** **2021/JUL/Q9** **2021/OCT/Q1** **2021/DEC/Q5** **2022/APR/Q7** **2022/AUG/Q8** **2023/JUL/Q1** **2023/DEC/Q9** **2025/SEP/Q8** **2026/APR/Q8**
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Q9.a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels of such vibration 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. (6)
(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. (4)

2022/AUG/Q9 **2024/AUG/Q1** **2025/MAR/Q3** **2025/SEP/Q9** **2025/OCT/Q3** **2026/APR/Q9**

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