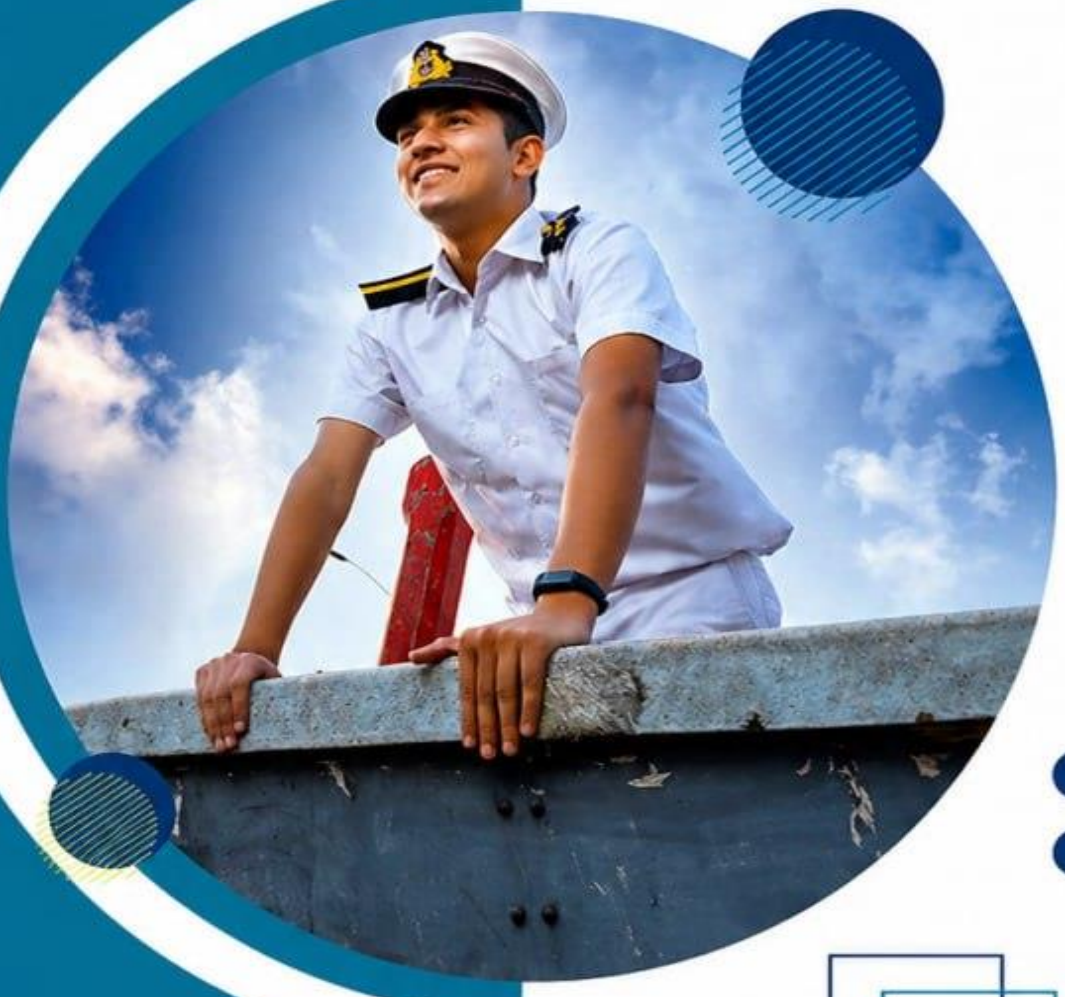
D. MARINE
Study Material

MEO CLASS 4 WRITTEN: EKM

(ENGINEERING KNOWLEDGE MOTOR)

FOR INDIAN COMPETENCY EXAM



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Study Material

JANUARY – 2026

Q1. Explain the method of obtaining the following diagrams on a 2-Stroke Main propulsion Engine:
a) Power Card, showing vital point of diagram. (4)
b) Out of phase diagram indicating vital points. (4)
c) Light spring diagram, indicating vital points. (4)
d) Compression diagram and its importance. (4)
2023/JULY/Q6 **2025/JAN2/Q1** **2026/JAN/Q1**
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Q2.a) With reference to crankshafts and piston crowns outline the main stresses to which these parts are subjected. (4)
b) In each case explain how the stresses are generated and how they vary in magnitude and direction during one cycle. (6)
c) With respect to the whole engine, describe how stresses may be accommodated by good design and influenced by poor maintenance. (6)
2022/NOV/Q7 **2022/DEC/Q2** **2023/APR/Q3** **2023/DEC/Q2**
2025/JAN2/Q2 **2026/JAN/Q2**
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Q3. a) What is crankshaft misalignment? (4)
b) What are the reasons for crankshaft misalignment? (8)
c) What is the effect on main engine of such misalignment. (4)
2023/JUN/Q3 **2025/JAN2/Q3** **2026/JAN/Q3**
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Q4. Describe following terms with respect to Diesel Engine with suitable diagram:
a) Natural aspiration (4)
b) Scavenging (4)

c) Types of Super charging in two stroke engine. (4)
d) Supercharging (4)
2023/MAY2/Q2 **2023/SEP/Q2** **2024/FEB/Q3** **2024/SEP2/Q1** **2025/JUN/Q1** **2026/JAN/Q4**
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Q5. a) Sketch and describe a fuel oil system of a large diesel engine, from settling tanks to main engine fuel injectors. (10)
b) Also comment on the importance of:
i) Heating arrangement with temperature control. (3)
ii) Prevention of air lock in the system. (3)
2023/MAY2/Q6 **2025/JAN2/Q5** **2026/JAN/Q5**
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Q6. a) How is a 2-stroke engine started? Describe the sequence of engine starting. (6)
b) Draw the Timing diagram of engine starting, showing crank position of each step. (6)
c) What is OVERLAP in engine starting (4)
2023/MAR/Q1 **2023/JULY/Q1** **2023/DEC/Q6** **2025/JAN2/Q6** **2026/JAN/Q6**
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Q7. With reference to the construction of a turbocharger, sketch and describe:
a) The rotor bearing and its method of lubrication. (6)
b) Labyrinth seal and explain how such a seal works. (6)
c) Impeller and diffuser. (4)
2023/JAN/Q8 **2023/MAY2/Q8** **2025/JAN2/Q7** **2026/JAN/Q7**
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Q8.a) Draw sectional diagram of exhaust valve of 2-stroke Diesel Engine. Name the different components of the valve. (8)
b) Describe working of the valve in operation. How valve rotation occurs

during operation and its purpose. (6)
c) What is the special material used on valve lid. (2)
2023/DEC/Q8 **2025/JAN2/Q8** **2026/JAN/Q8**
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Q9.a) What are the difficulties observed in lubrication of gear teeth in gear trains? (4)
b) Describe with diagram, how good lubrication to gear teeth is achieved?
c) What are the qualities of lubricating oil suitable for main Reduction Gearing of main engine? (6)
2023/DEC/Q9 **2025/JAN2/Q9** **2026/JAN/Q9**
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FEBRUARY – 2026

Q1. Every sudden rise in pressure during combustion accompanied by a metallic, hammer like sound is called knocking of the unit or detonation and usually occurs:
(a) Near the end of the process of combustion of fuel charge.
(b) Just before the fuel charge is about to ignite
(c) Immediately after the unit reaches peak pressure and before ignition of fuel
(d) At any stage of the combustion process.
State the correct answer and explain why the other reasons given are not justified. (16)
2026/FEB/Q1
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Q2. (a) List and explain the desirable properties of lubricating oil for different application such as for main engine, auxiliary engine and for cylinder lubrication. (8)
(b) Sketch an auxiliary engine lubricating oil circuit. (8)
2024/JUN/Q2 **2024/OCT/Q2** **2025/APR1/Q2** **2026/FEB/Q2**
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Q3. With reference to turbochargers:
(a) Explain the term surging, stating how it occurs, its effect on the turbocharger and how it can be avoided (8)
(b) Describe the procedures for cleaning EACH of the following and explain the precautions which should be taken: (8)
(i) Suction air
(ii) Turbine blades and nozzle ring
2024/JUN/Q3 **2024/OCT/Q3** **2025/APR1/Q3** **2026/FEB/Q3**
Click Here to See the Answer

Q4. Write short notes on:
(a) Control air dryer (4)
(b) Crankcase door (4)
(c) Auxiliary engine overspeed trip (4)
(d) Fuel oil leak off alarm (4)
2024/JUN/Q4 **2024/OCT/Q4** **2025/APR1/Q4** **2026/FEB/Q4**
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Q5. A large marine diesel main propulsion engine, speed fluctuates all the time during the voyage. Make written statements to the chief engineer explaining the observation of various engine parameters, during the voyage which could be indication of some fault, causing engine speed fluctuation.
2024/JUN/Q5 **2024/OCT/Q5** **2025/APR1/Q5** **2026/FEB/Q5**
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Q6. (a) What are the advantages of a thin shell bearing? (4)
(b) What are the typical bearing failures? Discuss at least four bearing failures. (8)
(c) Why is periodic analysis of the lubricating oil important? (4)
2024/JUN/Q6 **2024/OCT/Q6** **2025/APR1/Q6** **2026/FEB/Q6**
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Q7. (a) Why tie-rods are provided on a 2-stroke main engine? (6)
(b) Why tie rods are placed close to the centreline of the crankshaft? (5)
(c) What is a tie rod pinch screw? And what is its purpose? (5)
2024/JUN/Q7 **2024/OCT/Q7** **2025/APR1/Q7** **2026/FEB/Q7**
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Q8. Explain briefly how the different moving parts of a main engine are subjected to various stresses. Name the stresses and justify by stating how they originate. (16)
2024/MAY2/Q8 **2024/JUN/Q8** **2024/OCT/Q8** **2024/NOV/Q8** |
2025/APR1/Q8 **2025/JUL/Q8** **2026/FEB/Q8**
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Q9. Indicator cards have shown that one cylinder is high in power although the maximum pressure is low. State the associated effects that this might have on the various instruments of the engine and give a detailed description of the method of rectifying the defect. If this abnormality were not remedied, what might be the subsequent effects on the operation of the engine? State the type of engine to which your answer refers. (16)
2024/JUN/Q9 **2024/OCT/Q9** **2025/APR1/Q9** **2026/FEB/Q9**
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MARCH – 2026

Q1. Describe following terms with respect to Diesel Engine with suitable diagram:
(a) Natural Aspiration (4)
(b) Scavenging (4)
(c) Supercharging (4)
(d) Types of Super charging in two stroke engines. (4)
2023/MAY2/Q2 **2023/SEP/Q2** **2024/FEB/Q3** **2024/SEP2/Q1** **2025/JUN/Q1** **2026/JAN/Q4** **2026/MAR/Q1**
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Q2. a) State why double walled fuel pipes are employed for high pressure fuel lines. (6)
b) Sketch and describe such a double walled pipe arrangement and show how high-pressure pipe failure is indicated. (10)
2022/DEC/Q9 **2023/APR/Q9** **2023/SEP/Q6** **2023/DEC/Q5** **2024/SEP2/Q2** **2025/JUN/Q2** **2026/MAR/Q2**
Click Here to See the Answer

Q3. i) How power is calculated from indicator diagram. (6)
ii) How does Indicator diagram show early fuel injection? What are bad effects of too early injection? (5)
iii) What are indications of late injection on indicator diagram of the unit? What are bad effects of late injection of fuel on the units? (5)
2023/DEC/Q3 **2024/SEP2/Q3** **2025/JUN/Q3** **2026/MAR/Q3**
Click Here to See the Answer

Q4. With reference to a turbo-charging system of an engine:
a) State the parameters that you would check while taking over the watch.
b) Action to be taken in the event of turbo-charged is observed to vibrate abnormally. (8)
2024/SEP2/Q4 **2025/JUN/Q4** **2026/MAR/Q4**
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Q5. Discuss the consequences of failure to maintain correct clearances in the case of auxiliary diesel engine crankshaft and bottom end bearings. Describe the procedure of taking crankshaft deflection. (16)
2024/APR1/Q5 **2024/SEP2/Q5** **2025/JAN1/Q5** **2025/JUN/Q5** **2025/NOV/Q5** **2026/MAR/Q5**
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Q6.a) Describe how fuel injector components deteriorate with time? (6)
b) What are effects of deterioration of fuel injector components? (6)
c) What are the signs of a bad injector? (4)
2023/MAR/Q9 **2023/SEP/Q9** **2024/SEP2/Q6** **2025/JUN/Q6** **2026/MAR/Q6**
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Q7. With respect to a marine diesel engine:
a) What are the different types of lubrication system that you would see on the main and auxiliary machineries? (8)
b) What are the desirable qualities for the lubricating oil selected for each of the following duties: (8)
i) Auxiliary diesel engine
ii) Stern tube bearings
iii) Refrigeration system
iv) Turbocharger
2024/SEP2/Q7 **2025/JUN/Q7** **2026/MAR/Q7**
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Q8. With reference to cylinder liner wear in large slow speed engine:
a) State THREE major factors associated with wear. (4)
b) Explain the procedure for correct 'running in' of piston rings and cylinder liners. (4)
c) Explain what is achieved by 'running in' process. (4)
d) Describe how cylinder lubrication limits wear. (4)
2024/SEP2/Q8 **2025/JUN/Q8** **2026/MAR/Q8**

[Click Here to See the Answer]

Q9. Describe the action you as watch keeper would take and outline possible reasons for failure in both the following cases:
a) The auxiliary diesel engine fails to turn on starting air. (8)
b) The engine turns on starting air but fails to fire. (8)
2022/AUG/Q2 **2023/OCT/Q2** **2024/SEP2/Q9** **2025/JUN/Q9** **2026/MAR/Q9**
[Click Here to See the Answer]

APRIL – 2026

Q1. a) Sketch a main engine jacket water cooling system. (8)
b) State why chemical treatment of such systems is necessary. (4)
c) What tests are carried out to ascertain the level of the concentration of the chemicals in the jacket cooling water system? (4)
2023/AUG/Q2 **2024/JAN/Q1** **2024/DEC2/Q1** **2025/SEP/Q1** **2026/APR/Q1**
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Q2. (a) Describe with suitable sketches, how lubricating oil is conveyed to top end, bottom end and main bearings in a large bore slow speed engine.
(b) List the causes leading to sudden loss of lubricating oil pressure in the engine. (6)
2023/AUG/Q6 **2024/JAN/Q2** **2024/DEC2/Q2** **2025/SEP/Q2** **2026/APR/Q2**
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Q3. a) What is the function of charge air cooler on 2-stroke Diesel Engine?
b) Draw diagrammatic sketch of charge air cooler. Describe each part. (8)
c) How the efficiency of charge air cooler can be checked? (4)
2023/JULY/Q4 **2024/JAN/Q3** **2024/DEC2/Q3** **2025/SEP/Q3** **2026/APR/Q3**
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Q4. (a) Describe a pressure relief device fitted on a diesel engine crankcase. Are these devices fitted on all sizes of the engine? (8)
(b) What attention do crankcase pressure relief devices require? (4)
(c) Name the factors which must be present for an explosion to occur in the crankcase of a diesel engine. (4)
2024/DEC2/Q4 **2025/SEP/Q4** **2026/APR/Q4**
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Q5. a) In modern electronic type 2 stroke main engines which components are replaced by electronic equivalents. (8)
b) Describe by drawing a simple sketch, fuel injection system on electronic type engine. (6)
c) How fuel is injected at right moment in electronic type engine? (2)
2024/JAN/Q5 **2024/DEC2/Q5** **2025/SEP/Q5** **2026/APR/Q5**
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Q6. (a) Sketch and describe the significance of chocks? Give the three different types of chocks fitted in marine diesel engines. Briefly describe the purpose of each. (8)
(b) What are the different classification of chocks based on its material? (4)
(c) What are resilient chocks? Where are these fitted and why? (4)
2024/DEC2/Q6 **2025/SEP/Q6** **2026/APR/Q6**
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Q7. a) Draw diagrammatic sketch, describing each part of thrust block. (8)
b) Describe how propeller thrust is transmitted to hull? (4)
c) How to measure thrust clearances on the block? (4)
2024/JAN/Q7 **2024/DEC2/Q7** **2025/SEP/Q7** **2026/APR/Q7**
Click Here to See the Answer

Q8. a) Draw lubricating oil piping diagram with all fittings for a trunk type 4-stroke Diesel Engine. (8)
b) What properties are required for a lubricating oil used in a 4-stroke Diesel Engine? (4)
c) What is the effect on lubricating oil due to various contaminants during operation of engine? (4)
2024/JAN/Q8 **2024/DEC2/Q8** **2025/SEP/Q8** **2026/APR/Q8**
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Q9. With reference to engine inlet and exhaust valves:
(a) State why tappet clearance is essential and why it must be periodically checked. (6)

(b) List with reasons the likely consequences of excessive and insufficient tappet clearance. (4)
(c) State how carbon build-up can occur during engine running and indicate the possible effects on cylinder performance. (6)
2024/DEC2/Q9 **2025/SEP/Q9** **2026/APR/Q9**
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