D. MARINE
Study Material

MEO CLASS 4 WRITTEN: EKM

(ENGINEERING KNOWLEDGE MOTOR)

FOR INDIAN COMPETENCY EXAM

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MAY – 2023

Q1. Compare the desirable qualities of the lubricating oil selected for each of the following duties
(a) Auxiliary diesel engines (4)
(b) Stern tube bearings (4)
(c) Refrigeration compressors (4)
(d) Gear case of purifier (4) Give reasons for the differing properties of the oils recommended for these four purposes (16)
2023/MAY/Q1
Click Here to See the Answer

Q2. Make a report to the Chief Engineer of your vessel about malfunctioning of low lube oil pressure alarm for the auxiliary engine observed during your watch with special emphasis on the possible consequences (16)
2023/MAY1/Q2
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Q3. With reference to an auxiliary diesel engine
(a) Explain how a crankcase explosion may occur (4)
(b) Identify the indications of poor combustion (4)
(c) State FOUR reasons for poor combustion (4)
(d) Describe the effects on engine condition and maintenance by allowing poor combustion to continue (4)
2023/MAY1/Q3
Click Here to See the Answer

Q4. (a) Describe crankcase oil mist detector and the principle of its operation (8)
(b) Draw crankcase explosion relief door and name the parts State pressure setting of the door (8)
2023/MAY1/Q4

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Q5. If an auxiliary diesel generator overspeed's and runs away while off load explain
(a) How it can be stopped (6)
(b) What is likely to be the reasons for the failure (4)
(c) Give details of what checks are made after the engine has been stopped both regarding
(i) Mechanical checks
(ii) Electrical checks (6)
2023/MAY1/Q5
Click Here to See the Answer

Q6. (a) In a 4-stroke engine describe each of the four strokes of the engine
(b) Draw timing diagram of complete cycle (5)
(c) How each stroke is completed in the engine with action of crank travel and valves (6)
2023/MAY1/Q6
Click Here to See the Answer

Q7. (a) What are the structural parts of 2 stroke main engine (6)
(b) How are different structural parts held together (4)
(c) What is the function of crosshead guides (4)
2023/MAY1/Q7
Click Here to See the Answer

Q8. (a) Draw diagrammatic sectional view of crosshead of 2 stroke diesel engine Name each part (8)
(b) Describe function of each part (4)
(c) How concentric movement of piston rod is converted to angular movement of crankshaft (4)
2023/MAY1/Q8
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Q9. (a) With the help of simple diagram explain Variable Injection Timing VIT (8)
(b) Explain with suitable diagram start and end of VIT points (4)
(c) Explain with graph variation of Pmax with VIT position (4)
2023/MAY1/Q9
Click Here to See the Answer

JUNE – 2023

Q1. (a) Describe in detail a four-stroke cycle why it is called so (5)
(b) Draw 4 stroke engine cycle with crank position of each stroke (6)
(c) What is scavenging Show the scavenging step in the cycle diagram what is its importance (5)
2023/MAY2/Q1 **2023/JUN/Q1**
Click Here to See the Answer

Q2. (a) What is indicator diagram of a 2-stroke engine (4)
(b) Draw an indicator diagram mark each step of the cycle in the diagram
(c) What is mean effective pressure and how its value is obtained from indicator diagram (6)
2023/JUN/Q2
Click Here to See the Answer

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
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Q4. (a) What is function of guide shoe in a 2-stroke diesel engine (4)
(b) Draw diagrammatic sketch of guide shoe naming each part (8)
(c) Describe how guide shoes are lubricated (4)
2023/JUN/Q4
Click Here to See the Answer

Q5. (a) In jerk type fuel pump describe with diagrammatic sketch how metered quantity of fuel oil is delivered to cylinder unit (8)
(b) How is fuel injection timing changed in jerk type fuel pump (4)
(c) Describe effect of fuel injection time alteration on the performance of unit (4)
2023/JUN/Q5

Click Here to See the Answer

Q6. (a) Describe VIT of any 2-stroke marine diesel engine by diagrammatic sketch naming each component and its function (8)
(b) Describe following
(i) What is effective stroke and idle stroke of a fuel pump (2)
(ii) What is fuel pump lead (2)
(iii) What is super VIT (2)
(iv) What is breakpoint for VIT (2)
2023/JUN/Q6
Click Here to See the Answer

Q7. (a) Draw a diagrammatic sketch of the fuel oil system used in an electronic type of engine (8)
(b) Describe how fuel injection to unit is carried out (4)
(c) How fuel injection timing is obtained (2)
(d) Why fuel injection timing is precise in this system (2)
2023/JUN/Q7
Click Here to See the Answer

Q8. (a) How is shaft power obtained from torque measurement (4)
(b) What is procedure for measuring torque on propulsion shaft (4)
(c) Drawing a diagrammatic sketch describe the working of a strain gauge torsionmeter (8)
2023/JUN/Q8
Click Here to See the Answer

Q9. (a) Draw a simple sketch of turbocharger describing each component
(b) Describe how compressed air is delivered by the turbocharger to main engine (4)
(c) What arrangement is provided on turbocharged 2 stroke main diesel engine to provide compressed air while starting of main engine (4)
2023/JUN/Q9
Click Here to See the Answer

JULY – 2023

Q1. (a) How is a 2-stroke engine started Describe the sequence of engine starting (5)
(b) Draw the timing diagram of engine starting showing crank position of each step (6)
(c) What is overlap in engine starting (5)
2023/JULY/Q1
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Q2. (a) Draw sectional diagram of main engine piston showing each part (8)
(b) Show cooling passages for oil cooled piston (4)
(c) What is material of crown and other parts of piston (4)
2023/JULY/Q2
Click Here to See the Answer

Q3. (a) What is crank web deflection and purpose of measuring the same
(b) How crank web deflections are taken describe the process (6)
(c) Describe the process to locate faulty main bearing by taking crank web deflection measurement (6)
2023/JULY/Q3
Click Here to See the Answer

Q4. (a) What is function of charge air cooler on 2 stroke diesel engine (4)
(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
Click Here to See the Answer

Q5. (a) Draw diagrammatic sketch of boiler gauge glass Name each part and function (8)
(b) What safeties are provided on gauge glass in case of rupturing of the glass (4)

(c) Describe procedure for blow down of gauge glass (4)
2023/JULY/Q5
Click Here to See the Answer

Q6. For 2 stroke main engine of your ship how are the following obtained
(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
Click Here to See the Answer

Q7. (a) What are the various methods used for reversing the motion of ship
(b) With respect to reversing of main engine running direction explain following
(i) Lost motion (4)
(ii) Axial shifting of cams (4)
(iii) Roller displacement (4)
2023/JULY/Q7
Click Here to See the Answer

Q8. (a) By drawing a block diagram describe how on a large 2 stroke marine diesel engine fuel quantity and timing is controlled (8)
(b) What are the disadvantages of VIT system (4)
(c) What actions are required in case of VIT system failure (4)
2023/JULY/Q8
Click Here to See the Answer

Q9. (a) Describe procedure of changeover of high sulphur fuel from high seas to 0.1 percent sulphur in ECA zone (8)
(b) How time for changeover is determined such that vessel enters ECA zone with 0.1 percent sulphur (4)
(c) What entries are made in engine room logbook pertaining to low

sulphur oil changeover (4)

2023/JULY/Q9

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AUGUST – 2023

Q1. (a) With the aid of a block diagram describe the operation of an electronic governor fitted to an auxiliary diesel engine (8)
(b) An engine fitted with an electronic governor behaves erratically during load changes Explain the possible causes (8)
2023/AUG/Q1
Click Here to See the Answer

Q2. (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
Click Here to See the Answer

Q3. Describe the crankcase inspection of an auxiliary engine driving an alternator under each of the following headings
(a) Safety (4)
(b) Timing gears (4)
(c) Running gears (4)
(d) Oil pipes and system (4)
2023/AUG/Q3
Click Here to See the Answer

Q4. Difficulties have been experienced in getting the engine to turn on air during manoeuvring
(a) State the possible causes leading to such a problem (8)
(b) Remedial measures to be taken to prevent reoccurrence of such a problem (8)
2023/AUG/Q4
Click Here to See the Answer

Q5. During your watch one of the main engine units was indicating exhaust temperature reading Write a note to Chief Engineer explaining
(a) how the cause leading to abnormal running condition was diagnosed
(b) subsequent action taken to conrol the fire (8)
2023/AUG/Q5
Click Here to See the Answer

Q6. (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
Click Here to See the Answer

Q7. Sketch and describe a piston rod stuffing box incorporated in a two-stroke crosshead diesel engine which serves to prevent sludge and dirty oil from entering the crankcase (16)
2023/AUG/Q7
Click Here to See the Answer

Q8. Explain how the following conditions affect the power developed by a diesel engine
(a) Broken piston rings (4)
(b) Worn fuel pump plungers (4)
(c) Fouled turbochargers (4)
(d) Worn out liner (4)
2023/AUG/Q8
Click Here to See the Answer

Q9. Explain why it is necessary to heat heavy oil before burning it in the cylinder of an internal combustion engine Describe a system whereby the oil temperature can be automatically maintained at the correct figure Show the means employed for manually controlling the temperature in the event

of failure of the automatic controls (16)

2023/AUG/Q9

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SEPTEMBER – 2023

Q1. (a) Describe in detail a four-stroke cycle Why it is called so (5)
(b) Draw 4 stroke engine cycle with crank position of each stroke (6)
(c) What is scavenging Show the scavenging step in the cycle diagram what is its importance (5)
2023/MAY2/Q1 **2023/JUN/Q1** **2023/SEP/Q1**
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Q2. Describe following terms with respect to diesel engine with suitable diagram
(i) Natural aspiration (4)
(ii) Scavenging (4)
(iii) Supercharging (4)
(iv) Type of supercharging in two stroke engine (4)
2023/MAY2/Q2 **2023/SEP/Q2**
Click Here to See the Answer

Q3. With respect to modern 2 stroke diesel engine
(i) What is electronically controlled engine Which all functions of main engine are controlled electronically (8)
(ii) How these types of engines are superior to their earlier designs (8)
2023/MAY2/Q3 **2023/SEP/Q3**
Click Here to See the Answer

Q4. With reference to lubricating oil
(a) Explain why oil employed in the crankcase of a trunk piston engine differs in its properties from that employed in the crankcase of a crosshead engine (6)
(b) List four effects of bacterial attack on crankcase oil (6)
(c) Explain the action which must be taken if bacterial attack of the crankcase oil is detected (4)
2023/SEP/Q4
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Q5. (a) Describe the procedure for taking crankshaft deflections of auxiliary engine explaining all precautions that must be observed (8)
(b) Explain what deflection readings actually mean and suggest the action which must be taken should readings be outside values recommended by the engine manufacturer (8)
2023/SEP/Q5
Click Here to See the Answer

Q6. (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)
2023/SEP/Q6
Click Here to See the Answer

Q7. (i) What is the definition of the following
(a) Indicated power
(b) Brake power
(c) Specific fuel oil consumption
(d) Mechanical efficiency
(e) Thermal efficiency (10)
(ii) What is an indicator diagram of a diesel engine Draw a diagram and show different points related to diesel engine power measurement (6)
2023/SEP/Q7
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Q8. (a) What are the safety interlocks provided in compressed air starting system of main engine (8)
(b) Describe with a diagram the air starting system of a main engine (8)
2023/SEP/Q8
Click Here to See the Answer

Q9. (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/SEP/Q9
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OCTOBER- 2023

Q1. Compare the desirable qualities of the lubricating oil selected for each of the following duties
(a) Auxiliary diesel engines (4)
(b) Stern tube bearings (4)
(c) Refrigeration compressors (4)
(d) Gear case of purifier (4) Give reasons for the differing properties of the oils recommended for these four purposes (16)
2023/OCT/Q1
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Q2. 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)
2023/OCT/Q2
Click Here to See the Answer

Q3. Describe with the aid of sketches a system of turbocharging a two-stroke cycle main engine State the routine attention which should be given to the turbocharger Which parameters are to be recorded during watch keeping (16)
2023/OCT/Q3
Click Here to See the Answer

Q4. Make a report to the Chief Engineer of your vessel about malfunctioning of low lube oil pressure alarm for the auxiliary engine observed during your watch with special emphasis on the possible consequences (16)
2023/MAY1/Q2 **2023/OCT/Q4**
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Q5. With reference to an auxiliary diesel engine
(a) Explain how a crankcase explosion may occur (4)

(b) Identify the indications of poor combustion (4)
(c) State four reasons for poor combustion (4)
(d) Describe the effects on engine condition and maintenance by allowing poor combustion to continue (4)
2023/MAY1/Q3 **2023/OCT/Q5**
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Q6. When a medium speed diesel engine is used for propulsion purposes a coupling is required between engine and reverse reduction gear
(a) Sketch a hydraulic coupling for the above stated purposes (6)
(b) Describe how it operates (6)
(c) State what advantages such couplings have over their friction and magnetic alternatives (4)
2023/OCT/Q6
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Q7. (a) Sketch and describe crankcase oil mist detector and the principle of its operation (8)
(b) Draw crankcase explosion relief door and name the parts State pressure setting of the door (8)
2023/MAY1/Q4 **2023/OCT/Q7**
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Q8. Describe the process of replacing the cylinder liner in an auxiliary engine How is water tightness ensured and what precautions are taken before commissioning the engine (16)
2023/OCT/Q8
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Q9. If an auxiliary diesel generator overspeeds and runs away while off load explain
(a) How it can be stopped (6)
(b) What is likely to be the reasons for the failure (4)

(c) Give details of what checks are made after the engine has been stopped both regard to
(i) Mechanical checks
(ii) Electrical checks (6)
2023/OCT/Q9
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NOVEMBER – 2023

Q1. Describe following terms with respect to diesel engine with suitable diagram
(a) Piston stroke
(b) Swept volume
(c) Clearance volume
(d) Compression ratio (16)
2023/NOV/Q1
Click Here to See the Answer

Q2. (a) Draw sectional diagram of main engine piston showing each part (8)
(b) Show cooling passages for oil cooled piston (4)
(c) What is material of crown and other parts of piston (4)
2023/JULY/Q2 **2023/NOV/Q2**
Click Here to See the Answer

Q3. (a) What is the importance of measuring bearing clearance in a diesel engine (4)
(b) What is bridge gauge Describe its usage with diagram (6)
(c) What are the other recommended methods used onboard to check bearing clearance (6)
2023/NOV/Q3
Click Here to See the Answer

Q4. (i) What is an exhaust gas economizer Draw diagrammatic sketch of exhaust gas economizer naming each component (8)
(ii) How steam generation is controlled in exhaust gas economizers (4)
(iii) How to maintain efficiency of an exhaust gas economizer (4)
2023/NOV/Q4
Click Here to See the Answer

Q5. (i) While arrival port what checks are made on main engine
(i) Before arrival (4)

(ii) After arrival (2)
(ii) While departure port what checks are made on main engine and other machineries in engine room (4)
(iii) What precautions are taken while changing over main engine fuel from ECA region high seas and vice versa (6)
2023/NOV/Q5
Click Here to See the Answer

Q6. (i) What is thin shell bearing Describe with sketch the construction of thin shell bearing name each part (6)
(ii) What materials are used in construction of this type of bearing (4)
(iii) Describe superiority of thin shell bearing over its counterpart of thick shell bearing type (6)
2023/NOV/Q6
Click Here to See the Answer

Q7. For 2 stroke marine diesel engine
(i) Describe problems in achieving good lubrication of cylinder liner (6)
(ii) What are the properties of good cylinder oil (4)
(iii) What are the consequences of under and over lubrication of liner (8)
2023/NOV/Q7
Click Here to See the Answer

Q8. (i) What is a mechanical hydraulic governor (4)
(ii) By drawing a suitable diagram explain the working of a mechanical hydraulic governor (8)
(iii) What is speed droop describe the function of speed droop on the governor (4)
2023/NOV/Q8
Click Here to See the Answer

Q9. (i) Describe what is nozzle burning of fuel injectors and causes of nozzle burning on marine diesel engine (6)
(ii) What investigations are required to find causes for nozzle burning (6)

(iii) What actions are required to reduce the risk of nozzle burning (4)
2023/NOV/Q9
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DECEMBER – 2023

Q1. (a) What are the safety interlocks provided in compressed air starting system of main engine (8)
(b) Sketch and describe the air starting system of main engine (8)
2023/SEP/Q8 **2023/DEC/Q1**
Click Here to See the Answer

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)
2023/DEC/Q2
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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
Click Here to See the Answer

Q4. With reference to auxiliary engine fuel pumps
(a) Explain how a fuel pump may be checked for accuracy of injection timing (6)
(b) Describe how fuel pump may be adjusted after overhaul (5)
(c) Explain the circumstances in which it is considered necessary to replace a fuel pump (5)
2023/DEC/Q4
Click Here to See the Answer

Q5. (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)
2023/SEP/Q6 **2023/DEC/Q5**
Click Here to See the Answer

Q6. (a) How is 2 stroke engines started Describe the sequence of engine starting step (5)
(b) Draw the timing diagram of engine starting showing crank position of each (6)
(c) What is overlap in engine starting (5)
2023/JULY/Q1 **2024/DEC/Q6**
Click Here to See the Answer

Q7. With respect to modern 2 stroke diesel engine
(a) What is electronically controlled engine Which all functions of main engine are controlled electronically (8)
(b) Discuss how these types of engines are superior to their earlier designs
(c) Name at least 2 makers of electronically controlled engines and their types (2)
2023/DEC/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
Click Here to See the Answer

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

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