D. MARINE
Study Material

MEO CLASS 4 WRITTEN: EKG

(ENGINEERING KNOWLEDGE GENERAL)

FOR INDIAN COMPETENCY EXAM

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D. MARINE
Study Material

JANUARY – 2025 (PART-1)

Q1. With reference to electric arc welding:
(a) Draw a labelled sectional sketch of a satisfactory butt weld. (4)
(b) Briefly define the following defects that may occur and how they may have been caused: (12)
(i) Under cut
(ii) Splatter
(iii) Inclusion
(iv) Blow hole
(v) Incomplete root penetration
(vi) Lack of fusion
2024/JUL/Q1 **2025/JAN1/Q1**
Click Here to See the Answer

Q2. Make a diagrammatic sketch of an exhaust gas boiler. Describe its construction and explain how it
is maintained in an efficient condition (16)
2023/AUG/Q9 **2024/JUL/Q2** **2025/JAN1/Q2**
Click Here to See the Answer

Q3. Explain the following briefly with reference to a domestic refrigeration system on board a ship. (16)
(a) Ingress of air into the freon system.
(b) Loss of refrigerant from a condenser.
(c) Water in the freon system.
(d) Icing of condenser external surface.
2024/JUL/Q3 **2025/JAN1/Q3**
Click Here to See the Answer

Q4. (a) Sketch a water-tight door and frame showing manner of attachment to bulkhead and the

additional reinforcement carried by the bulkhead to compensate for the aperture (8)
(b) Explain how watertightness of the door and frame mating surface is ensured with a hydrostatic pressure tending to force the faces apart. (4)
(c) Describe the means of remote closing operation of the door and state how many closing stations there are and their position. (4)
2024/JUL/Q4 **2025/JAN1/Q4**
Click Here to See the Answer

Q5. Sketch and explain the construction of a feed Check Valve. Why is it known as double shut off arrangement. (16)
2024/JUL/Q5 **2025/JAN1/Q5**
Click Here to See the Answer

Q6. with reference to auxiliary boiler water impurity define the effects of the following salts: (16)
(a) Calcium carbonate,
(b) Sodium chloride,
(c) Magnesium chloride,
(d) Calcium sulphate
Explain how the quantity of each is determined and controlled.
2024/JUL/Q6 **2025/JAN1/Q6**
Click Here to See the Answer

Q7. Write short notes on the following:
(a) Ultrasonic testing (8)
(b) Shaft earthing device (8)
2024/JUL/Q7 **2025/JAN1/Q7**
Click Here to See the Answer

Q8. (a) Sketch a screw displacement pump and explain its operation (10)
(b) State the factors which affect its efficiency. (6)
2024/JUL/Q8 **2025/JAN1/Q8**
Click Here to See the Answer

Q9) With reference to main air reservoirs:
(a) Explain with line sketch the manner in which mountings are attached to the shell (6)
(b) Explain why regular internal inspection is advisable (4)
(c) What are the areas that need particular attention during the inspection and survey of a main air reservoir. (6)
2024/APR1/Q7 **2024/JUL/Q9** **2024/AUG/Q7** **2025/JAN1/Q9**
Click Here to See the Answer

JANUARY – 2025 (PART-1)

Q1) (a) Using a line diagram, show the arrangement of 'emergency bilge suction' for a general cargo ship (8)
(b) State the purpose of 'bilge injection valve' and to which pump or pumps it is connected. Give reasons.
(c) State requirements with respect to the dimensions of the bilge injection valve and the main sea suction valve on the sea chest. (4)
2023/NOV/Q7 **2024/APR2/Q1** **2025/JAN2/Q1**
Click Here to See the Answer

Q2) (a) What are the advantages and disadvantages of the single-coil type and the straight-tube type of inter-cooler for air compressor? (10)
(b) Why are the tubes and coils generally made of copper? (6)
2024/APR2/Q2 **2025/JAN2/Q2**
Click Here to See the Answer

Q3) (a) With the aid of a sketch describe the working of a shell and tube type freshwater generator. (10)
(b) What are the probable causes of fluctuating and unsteady vacuum in such an evaporator and what would be the consequence of such an unsteady vacuum? (6)
2024/APR2/Q3 **2025/JAN2/Q3**
Click Here to See the Answer

Q4) (a) Make a detailed sketch of a Ship's domestic refrigeration system. (8)
(b) Give a full description of such a Refrigeration System, explaining the purpose of the relevant control and safety devices. (8)
2024/APR2/Q4 **2025/JAN2/Q4**
Click Here to See the Answer

Q5) (a) In the context of auxiliary boiler. Explain what do you understand by the term 'foaming'. List the measures you would consider to prevent it? Is it different from 'priming' in the auxiliary boiler context?
(b) Explain any one of the following with a sketch. (6)

(i) Composite boiler
(ii) Exhaust gas economiser
(c) What is the significance of 'de-aeration' of the boiler water? How is it achieved and what are the effects if ignored? (4)
2025/JAN2/Q5
Click Here to See the Answer

Q6) Write short notes to explain the following fittings/devices used in engine room, and their applications: (16)
(a) Low sea suction
(b) Fretting corrosion
(c) Caustic embrittlement
(d) Air starting motor
2024/APR2/Q6 **2025/JAN2/Q6**
Click Here to See the Answer

Q7) (a) Sketch a four-ram steering gear arrangement capable of 100% redundancy. (8)
(b) Describe the operation of the arrangement sketched in (a). (8)
2024/APR2/Q7 **2025/JAN2/Q7**
Click Here to See the Answer

Q8) (a) Sketch a line diagram showing a typical 'Inert Gas System' used for inerting the cargo tanks of oil tankers, labelling the component parts (8)
(b) Describe the system (8)
(c) State what oxygen content you would expect in the flue gases if good combustion is achieved
2024/JAN/Q2 **2024/APR2/Q8** **2025/JAN2/Q8**
Click Here to See the Answer

Q9) (a) Sketch a nozzle/flapper device used for the generation of a pneumatic signal, labelling the component parts (10)
(b) Describe the operation of the device in (a) above (6)
2024/APR2/Q9 **2025/JAN2/Q9**
Click Here to See the Answer

FEBRUARY – 2025

Q1) (a) With a line diagram, explain the working of the Quick Closing Valve?
(b) Why do you need the Quick Closing Valves on the fuel and lube oil lines?
(c) Explain how to reset the valve after a trial. How is the periodic test carried out and what are the areas of concern that need special attention.
2024/APR1/Q1 **2024/AUG/Q1** **2025/FEB/Q1**
Click Here to See the Answer

Q2) (a) Describe the constructional features of plate type freshwater generator and its operational procedures for freshwater generation. (6)
(b) State the temperatures and pressures at salient points. (4)
(c) State some of the advantages and limitations that exist in using a plate type heat exchanger. (6)
2022/JUL/Q2 **2022/NOV/Q2** **2023/APR/Q2** **2024/FEB/Q6**
2024/APR1/Q2 **2024/SEP2/Q1** **2024/DEC2/Q6** **2025/FEB/Q2**
Click Here to See the Answer

Q3) (a) With a diagram of the lubricating oil line, explain the working of an automatic backflushing filter placed on the lubricating oil line of the main engine. (10)
(b) List the main difference between such filter and a centrifugal separator.
2024/APR1/Q3 **2024/AUG/Q3** **2025/FEB/Q3**
Click Here to See the Answer

Q4) (a) Describe TWO methods of tracing a superficial crack in a casting used as an engine component.
(b) Explain how propagation of a crack in a machinery component can be arrested. (8)
2024/APR1/Q4 **2024/AUG/Q4** **2025/FEB/Q4**
Click Here to See the Answer

Q5) (a) How is the tensile strength of a metal determined? What other information is obtained when a tensile test is made? (8)

(b) Name the non-destructive tests used during the manufacture and service of a diesel engine components and associated equipments. Give an example of where each test is used. (8)
2024/MAR/Q5 **2024/APR1/Q5** **2024/AUG/Q5** **2024/DEC1/Q5** **2025/FEB/Q5**
Click Here to See the Answer

Q6) Write short notes to explain the following fittings/devices used in engine room, and their applications:
(a) Gear pump (5)
(b) Priming pump of Emergency fire pump (5)
(c) PID controller (6)
2024/APR1/Q6 **2024/AUG/Q6** **2025/FEB/Q6**
Click Here to See the Answer

Q7) Write short notes on the following:
(a) Need for draining F.O. Services tanks regularly (4)
(b) Need to ensure engine control room temperature is correctly maintained (4)
(c) Need to ensure that service air is kept dry by all means (4)
(d) To ensure that all guard rails are in place properly secured in the engine room (4)
2024/MAY2/Q8 **2025/FEB/Q7**
Click Here to See the Answer

Q8) With regard to the carriage of crude oil and its associated products:
(a) Sketch an explosimeter suitable for testing pump rooms or tanks, and give a brief description of the operation of this explosimeter (10)
(b) What periodic maintenance or checks are carried out on the P-V Breaker fitted on a tanker ship? (6)
2024/APR1/Q8 **2024/AUG/Q8** **2025/FEB/Q8**
Click Here to See the Answer

Q9) Explain the following:

(a) Control air dryer - working principle with diagram, of any one type of dryer of your choice (8)
(b) Any two types of Ballast water treatment system (8)
2024/APR1/Q9 **2024/SEP2/Q9** **2025/FEB/Q9**
Click Here to See the Answer

MARCH -2025

Q1) With reference to electric arc welding:
(a) Draw a labelled sectional sketch of a satisfactory butt weld. (8)
(b) Discuss the advantages and disadvantages of using alternating current and direct current in this type of welding. (8)
2024/MAY2/Q1 **2025/MAR/Q1**
Click Here to See the Answer

Q2) (a) Sketch a two-ram type hydraulic steering gear with a single Electro-hydraulic pumping unit. Show the hunting gear arrangement and indicate valve positions (8)
(b) State the purpose of, and describe the operation of:
(i) Hydraulic shock/buffer valves (3)
(ii) On replenishing tank (2)
(iii) Hunting gear (3)
2022/OCT/Q8 **2023/DEC/Q8** **2024/MAY2/Q2** **2024/SEP1/Q2** **2025/MAR/Q2**
Click Here to See the Answer

Q3) A controllable pitch propeller on a diesel driven vessel eliminates the need for: (16)
(a) Friction clutches
(b) Disconnect clutches
(c) Reversing gears
(d) Reduction gears
Justify your answer and explain the working of CPP in brief.
2024/MAY2/Q3 **2025/MAR/Q3**
Click Here to See the Answer

Q4) Describe with the aid of suitable graph, the discharge characteristics of a centrifugal pump. Explain why it does not require a relief valve (16)
2024/MAY2/Q4 **2024/SEP1/Q4** **2025/MAR/Q4**
Click Here to See the Answer

Q5) With regard to a reciprocating refrigerator compressor.
(a) Sketch the mechanical shaft seal showing its component parts and how it is lubricated (8)
(b) Describe the sealing arrangement stating the materials used for the component parts (4)
(c) State the effect on the environment of the release of refrigerants into the atmosphere (4)
2024/MAY2/Q5 **2024/SEP1/Q5** **2025/MAR/Q5**
Click Here to See the Answer

Q6) (a) Sketch an auxiliary boiler 'blow down' valve. Explain how it differs from its shipside counterpart
(b) Describe the sequence of 'blow down' procedure (6)
2024/MAY2/Q6 **2024/SEP1/Q6** **2025/MAR/Q6**
Click Here to See the Answer

Q7) Submit a report to the Chief Engineer stating how the freshwater generator output on board you ship was increased to near optimal values. The report should specifically mention the adjustments, corrections and improvements executed (16)
2024/MAY2/Q7 **2024/SEP1/Q7** **2025/MAR/Q7**
Click Here to See the Answer

Q8) Write short notes on the following:
(a) Need for draining F.O. Services tanks regularly (4)
(b) Need to ensure engine control room temperature is correctly maintained (4)
(c) Need to ensure that service air is kept dry by all means (4)
(d) To ensure that all guard rails are in place properly secured in the engine room (4)
2024/MAY2/Q8 **2025/FEB/Q7** **2025/MAR/Q8**
Click Here to See the Answer

Q9) Sketch and describe a contra flow type heat exchanger for the auxiliary engine applications. (16)

2024/MAY2/Q9 **2025/MAR/Q9**

Click Here to See the Answer

APRIL – 2025 (PART-1)

Q1) (a) Describe the constructional features of plate type freshwater generator and its operational procedures for freshwater generation. (6)
(b) State the temperatures and pressures at salient points. (4)
(c) State some of the advantages and limitations that exist in using a plate type heat exchanger. (6)
2022/JUL/Q2 **2022/NOV/Q2** **2023/APR/Q2** **2024/FEB/Q6** **2024/APR1/Q2** **2024/SEP2/Q1** **2024/DEC2/Q6** **2025/FEB/Q2** **2025/APR1/Q1**
Click Here to See the Answer

Q2. State the causes and remedial actions to be taken in case of the following detected on a reciprocating air compressor:
(a) Water mixed in the crankcase oil (4)
(b) L.P. safety valve blowing (4)
(c) Bursting disc rupture (4)
(d) Defective piston rings (4)
2024/SEP2/Q2 **2025/APR1/Q2**
Click Here to See the Answer

Q3. (a) Sketch a line diagram showing a typical 'Inert Gas System' used for inerting the cargo tanks of oil tankers, labelling the component parts (8)
(b) Describe the system (8)
2024/SEP2/Q3 **2025/APR1/Q3**
Click Here to See the Answer

Q4) A distinguishing feature of an eductor, when compared to other pumps, is the (16)
(a) Discharge end being smaller than the suction end
(b) Small size of impeller
(c) Lack of moving parts
(d) Ease at which the wearing rings may be changed
Briefly justify your answer.
2024/MAY1/Q3 **2024/SEP2/Q4** **2024/OCT/Q3** **2025/APR1/Q4**

Click Here to See the Answer

Q5. (a) Whilst on 'Sea watch' you observe that the Oil Mist detector (OMD) in the engine room has triggered an alarm; and in feeling the crankcase doors on the bottom platform, you find that the unit in question feels warmer than the rest. What pre-emptive action will you take as Watch-keeper to bring the situation under control (10)
(b) Draw a simple line diagram of a 'OMD' and explain it's working (6)
2023/DEC/Q4 **2024/MAY1/Q9** **2024/SEP2/Q5** **2024/OCT/Q9** **2025/APR1/Q5**
Click Here to See the Answer

Q6. With reference to control system explain in brief,
a) Two step action. (6)
b) Proportional control. (5)
c) Offset. (5)
2023/AUG/Q5 **2024/JAN/Q1** **2024/SEP2/Q6** **2025/APR1/Q6**
Click Here to See the Answer

Q7. (a) Why Engineering Materials are tested prior manufacturing of their components. (6)
(b) Describe the various 'destructive' and 'non-destructive' tests carried out on materials for shipboard
used. Explain the purpose of each test and where the same applied. (10)
2023/FEB/Q1 **2024/JAN/Q3** **2024/SEP2/Q7** **2025/APR1/Q7**
Click Here to See the Answer

Q8. (a) Explain 'short cycling' in the context of refrigeration and air conditioning systems onboard ship. State its causes and how it can be avoided. (6)
(b) State the symptoms of 'overcharging' and 'undercharging' in refrigeration system. What are its effects and state remedial measures (5)
(c) What are the visible indicators of oil in refrigeration system. What would be its effects? State remedial measures (5)
2023/FEB/Q7 **2024/SEP2/Q8** **2025/APR1/Q8**

Click Here to See the Answer

Q9) Write short notes on:
(a) Control air dryer - working principle with diagram, of any one type of dryer of your choice (8)
(b) Any two types of Ballast water treatment system (8)
2024/APR1/Q9 **2024/SEP2/Q9** **2025/FEB/Q9** **2025/APR1/Q9**
Click Here to See the Answer

APRIL – 2025 (PART-1)

Q1. (a) What are the different types of coupling bolts used in practice? Name at least 3. (3)
(b) Explain with the help of sketch, as to how a 'pilgrim' hydraulic bolt is fitted and removed? (8)
(c) How are fitted bolts installed on the coupling? (5)
2023/DEC/Q1 **2024/JUN/Q1** **2024/NOV/Q1** **2025/APR2/Q1**
Click Here to See the Answer

Q2. (a) Explain the working principle of a fuel oil purifier. (8)
(b) Explain briefly the significance of the friction clutch mechanism. (4)
(c) List the alarms and trips associated with a purifier. (4)
2024/JUN/Q2 **2024/NOV/Q2** **2025/APR2/Q2**
Click Here to See the Answer

Q3. Which of the materials listed is used as the dynamic seal material on mechanical seals installed on most centrifugal pumps used in water service? (16)
(a) Copper.
(b) Copper and carbon.
(c) Carbon.
(d) Bronze.
Briefly justify your answer.
2024/JUN/Q3 **2024/NOV/Q3** **2025/APR2/Q3**
Click Here to See the Answer

Q4. (a) Sketch and describe a central cooling fresh system for a motor ship.
(b) State the possible causes of corrosion in the closed system described in (a). (4)
(c) Explain how protections against corrosion is provided? (4)
2024/JUN/Q4 **2024/NOV/Q4** **2025/APR2/Q4**
Click Here to See the Answer

Q5. (a) State why the presence of oil in boiler water is considered serious.
(b) Suggest likely sources of oil contamination. (4)
(c) Describe how the source is traced. (4)
(d) Describe how the whole steam plant is restored to oil free conditions.
2024/JUN/Q5 **2024/NOV/Q5** **2025/APR2/Q5**
Click Here to See the Answer

Q6. Describe the following metallurgical tests and explain why EACH is carried out:
(a) Impact test (4)
(b) Hardness test (4)
(c) Endurance test (4)
(d) Tensile test (4)
2024/JUN/Q6 **2024/NOV/Q6** **2025/APR2/Q6**
Click Here to See the Answer

Q7. If a radial piston hydraulic pump fails to deliver rated fluid volume, the cause can be (16)
(a) Contaminated fluid
(b) Pitted thrust rings
(c) Worn pintle bearings
(d) Obstructed suctions passage
Briefly justify your answer.
2024/JUN/Q7 **2024/NOV/Q7** **2025/APR2/Q7**
Click Here to See the Answer

Q8. Write short notes on the following:
(a) Incinerators (5)
(b) Airline relief valve (5)
(c) Mixing column (6)
2024/JUN/Q8 **2024/NOV/Q8** **2025/APR2/Q8**
Click Here to See the Answer

Q9. (a) Make a detailed sketch of a direct expansion two room refrigeration system. (10)

(b) Give a full description of such a Refrigeration System, explaining the purpose of the relevant control
and safety devices. (6)
2024/JUN/Q9 **2024/NOV/Q9** **2025/APR2/Q9**
Click Here to See the Answer

JUNE - 2025

Q1. (a) How does fouling affect the performance of a heat exchanger? (4)
(b) Describe the types of plugs used to plug the ends of a leaky heat exchanger tube. (6)
(c) What is a differential pressure gauge? Where is it used? (6)
2024/MAR/Q1 **2024/DEC1/Q1** **2025/JUN/Q1**
Click Here to See the Answer

Q2. (a) Why are centrifugal pumps used for the sea and cooling water services with marine diesel engines? What are their drawbacks? (6)
(b) What do you understand by the term 'pump characteristics'? (6)
(c) What is net positive suction head? (4)
2024/MAR/Q2 **2024/DEC1/Q2** **2025/JUN/Q2**
Click Here to See the Answer

Q3. (a) With a sketch of the fuel line diagram explain the bunkering process and the checks to be undertaken before bunkering, during and after completion of the bunkering operation. (10)
(b) What are the safety features of the fuel line? (6)
2024/MAR/Q3 **2024/DEC1/Q3** **2025/JUN/Q3**
Click Here to See the Answer

Q4. (a) Explain the function of an 'eductor' with the aid of a sketch. Where do you find an eductor system on a ship? Give two examples. (8)
(b) Explain the working principle of an eductor. What are the operational challenges that may affect the performance of the eductor? (8)
2024/MAR/Q4 **2024/DEC1/Q4** **2025/JUN/Q4**
Click Here to See the Answer

Q5) (a) How is the tensile strength of a metal determined? What other information is obtained when a tensile test is made? (8)
(b) Name the non-destructive tests used during the manufacture and service of a diesel engine components and associated equipments. Give an example of where each test is used. (8)

2024/MAR/Q5 **2024/APR1/Q5** **2024/AUG/Q5** **2024/DEC1/Q5** **2025/FEB/Q5** **2025/JUN/Q5**
Click Here to See the Answer

Q6. Write short notes to explain the following fittings/devices used in engine room, and their applications: (16)
(a) Gate valve
(b) Butterfly valve
(c) Quick Closing valve
(d) Valve actuators
2023/MAY1/Q4 **2024/MAR/Q6** **2024/DEC1/Q6** **2025/JUN/Q6**
Click Here to See the Answer

Q7. Sketch and describe how the torque is transmitted to the rudder stock in a rotary vane steering gear. (16)
2024/MAR/Q7 **2024/DEC1/Q7** **2025/JUN/Q7**
Click Here to See the Answer

Q8. With reference to the marine boiler operation, answer the following:
(a) What do you understand by 'accumulation of pressure' test? Explain. (8)
(b) Why is a Boiler water circulating pump required for ships fitted with an Exhaust gas Economiser?
Explain with a line diagram. (8)
2024/DEC1/Q8 **2025/JUN/Q8**
Click Here to See the Answer

Q9. Explain any four of the following: (4*4)
(a) Difference between crude oil washing and tank cleaning
(b) Dynamic positioning system and its types
(c) Deaeration tank in the HT Jacket Cooling Water System
(d) Thermostatic expansion valve
(e) Proportional controller with examples
2024/MAR/Q9 **2024/DEC1/Q9** **2025/JUN/Q9**
Click Here to See the Answer

JULY - 2025

Q1) With reference to rotary vane steering gears:
(a) Describe, with the aid of a sketch, how such a unit incorporates an integral rudder carrier (10)
(b) Explain how vertical rudder movement is accommodated (6)
2024/MAY1/Q1 **2024/OCT/Q1** **2025/JUL/Q1**
Click Here to See the Answer

Q2) A main air compressor interstage air-cooler has burst. Put down a logical sequence of event that could have caused this accident. Put down your analysis, point by point and complete in technical detail
2024/MAY1/Q2 **2024/OCT/Q2** **2025/JUL/Q2**
Click Here to See the Answer

Q3) A distinguishing feature of an eductor, when compared to other pumps, is the (16)
(a) Discharge end being smaller than the suction end
(b) Small size of impeller
(c) Lack of moving parts
(d) Ease at which the wearing rings may be changed
Briefly justify your answer.
2024/MAY1/Q3 **2024/SEP2/Q4** **2024/OCT/Q3** **2025/APR/Q4** **2025/JUL/Q3**
Click Here to See the Answer

Q4) Give an outline sketch of Heavy F.O. settling tank heating system and briefly explain the system. Sketch only the low-pressure steam inlet upto condensate collection tank
2024/MAY1/Q4 **2024/OCT/Q4** **2025/JUL/Q4**
Click Here to See the Answer

Q5) The auxiliary boiler of a ship periodically needs feed water, and the rate of feed is gradually increasing every day, without an increase in demand. Suggest some causes for such a happening. (16)

2024/MAY1/Q5 **2024/OCT/Q5** **2025/JUL/Q5**
Click Here to See the Answer

Q6) Write short notes on the following:
(a) Need to ensure that D.O. service tanks are not heated beyond a certain temperature (4)
(b) Importance of the level of the F.W. compensating tank for jacket cooling of main engines as an indicator of impending trouble (4)
(c) Need to check remote stop of all F.O. installations regularly (4)
(d) Necessity for a proper check of all engine room parameters before taking over of watch (4)
2024/MAY1/Q6 **2024/OCT/Q6** **2025/JUL/Q6**
Click Here to See the Answer

Q7) The by-products of oxidation, as a result of water contamination of hydraulic oil are generally: (16)
(a) Removed by cellulose type filters
(b) Gums, varnishes, and acids
(c) Always neutralized by oil additives
(d) Harmless and have no effect on system components
Briefly justify your answer.
2024/MAY1/Q7 **2024/OCT/Q7** **2025/JUL/Q7**
Click Here to See the Answer

Q8) Explain the following terms and give examples of where each condition might occur:
(a) Stress Corrosion cracking (6)
(b) Creep cracking (5)
(c) Corrosion fatigue (5)
2022/OCT/Q1 **2023/DEC/Q6** **2024/MAY1/Q8** **2024/OCT/Q8** **2025/JUL/Q8**
Click Here to See the Answer

Q9) (a) Whilst on 'Sea watch' you observe that the Oil Mist detector (OMD) in the engine room has triggered an alarm; and in feeling the crankcase

doors on the bottom platform, you find that the unit in question feels warmer than the rest. What pre-emptive action will you take as Watch-keeper to bring the situation under control (10)
(b) Draw a simple line diagram of a 'OMD' and explain it's working (6)
2023/DEC/Q4 **2024/MAY1/Q9** **2024/SEP2/Q5** **2024/OCT/Q9** **2025/APR/Q5** **2025/JUL/Q9**
Click Here to See the Answer

AUGUST- 2025

Q1. (i) Discuss the use of non-metals onboard ships & name some of the common nonmetals used. (4)
(ii) What are their areas of application on ships? (4)
(iii) Name the advantages & also the limitations in using non-ferrous materials (8)
2023/MAY2/Q2 **2024/SEP1/Q1** **2025/AUG/Q1**
Click Here to See the Answer

Q2) (a) Sketch a two-ram type hydraulic steering gear with a single Electro-hydraulic pumping unit. Show the hunting gear arrangement and indicate valve positions (8)
(b) State the purpose of, and describe the operation of:
(i) Hydraulic shock/buffer valves (3)
(ii) Oil replenishing tank (2)
(iii) Hunting gear (3)
2022/OCT/Q8 **2023/DEC/Q8** **2024/MAY2/Q2** **2024/SEP1/Q2** **2025/MAR/Q2** **2025/AUG/Q2**
Click Here to See the Answer

Q3. Explain how each of the following conditions contribute to the satisfactory performance of oil centrifuges.
(a) Correct bowl speed (4)
(b) Cleanliness of bowl (4)
(c) Low rate of feed to bowl (4)
(d) Contaminated oil allowed to stand for an appreciable time prior to centrifuging. (4)
2022/AUG/Q5 **2023/MAY2/Q5** **2023/OCT/Q5** **2024/SEP1/Q3** **2025/AUG/Q3**
Click Here to See the Answer

Q4) Describe with the aid of suitable graph, the discharge characteristics of a centrifugal pump. Explain why it does not require a relief valve (16)

2024/MAY2/Q4 **2024/SEP1/Q4** **2025/MAR/Q4** **2025/AUG/Q4**
Click Here to See the Answer

Q5) With regard to a reciprocating refrigerator compressor.
(a) Sketch the mechanical shaft seal showing its component parts and how it is lubricated (8)
(b) Describe the sealing arrangement stating the materials used for the component parts (4)
(c) State the effect on the environment of the release of refrigerants into the atmosphere (4)
2024/MAY2/Q5 **2024/SEP1/Q5** **2025/MAR/Q5** **2025/AUG/Q5**
Click Here to See the Answer

Q6) (a) Sketch an auxiliary boiler 'blow down' valve. Explain how it differs from its shipside counterpart
(b) Describe the sequence of 'blow down' procedure (6)
2024/MAY2/Q6 **2024/SEP1/Q6** **2025/MAR/Q6** **2025/AUG/Q6**
Click Here to See the Answer

Q7) Submit a report to the Chief Engineer stating how the freshwater generator output on board you ship was increased to near optimal values. The report should specifically mention the adjustments, corrections and improvements executed (16)
2024/MAY2/Q7 **2024/SEP1/Q7** **2025/MAR/Q7** **2025/AUG/Q7**
Click Here to See the Answer

Q8. i) Sketch and describe a fuel system diagram for a 2 stroke Marine diesel engine from storage / service tank to fuel injectors. Show the various components and fittings which are provided in the circuit. What is the purpose of mixing columns & autode-aerating valve? (16)
2023/MAY2/Q6 **2024/SEP1/Q8** **2025/AUG/Q8**
Click Here to See the Answer

Q9. a) Bunkering as a shipboard operation has its own significance. List out the important inspects of a bunkering operation including the preparation and precaution to be taken to ensure a safe operation.
b) What does the Bunker specification include and how does it affect the engines adversely? Name at least three such ingredients that you expect in a Heavy Fuel Oil bunker and the effects on the engine operation. (8)
2024/SEP1/Q9 **2025/AUG/Q9**
Click Here to See the Answer

SEPTEMBER - 2025

Q1. (a) What are the different types of coupling bolts used in practice? Name at least 3. (3)
(b) Explain with the help of sketch, as to how a 'pilgrim' hydraulic bolt is fitted and removed? (8)
(c) How are fitted bolts installed on the coupling? (5)
2023/DEC/Q1 **2024/JUN/Q1** **2024/NOV/Q1** **2025/APR2/Q1** **2025/SEP/Q1**
Click Here to See the Answer

Q2. i) Sketch and describe the modern purification system using 'ALCAP' concept for purifying fuel specific gravity about 0. 991. (8)
ii) Explain how 'ALCAP' separator operates as clarifier & how is the water drained off? (4)
iii) What is 'paring disc'? How does it function? (4)
2023/NOV/Q4 **2023/DEC/Q2** **2025/SEP/Q2**
Click Here to See the Answer

Q3. Clean and dry control air is essential for efficient troublefree operation of a ship's pneumatic' control air system.
a) Sketch and describe a low-pressure control air system used on board ships showing various arrangements to deal with dust oil and moisture as well as safety system.
b) Explain using a line diagram, arrangements provided, to reduce the air pressure to 7/8 bars. Required for control air system. (8)
2023/DEC/Q3 **2025/SEP/Q3**
Click Here to See the Answer

Q4. (a) Whilst on 'Sea watch' you observe that the Oil Mist detector (OMD) in the engine room has triggered an alarm; and in feeling the crankcase doors on the bottom platform, you find that the unit in question feels warmer than the rest. What pre-emptive action will you take as Watch-keeper to bring the situation under control (10)
(b) Draw a simple line diagram of a 'OMD' and explain it's working (6)

2023/DEC/Q4 **2024/MAY1/Q9** **2024/SEP2/Q5** **2024/OCT/Q9** **2025/APR1/Q5** **2025/JUL/Q9** **2025/SEP/Q4**
Click Here to See the Answer

Q5. i) Define 'centrifugal pump' and where it is used on ships? Using a simple line diagram show a circuit which include a centrifugal pump. Explain the meaning of 'suction lift'. (6)
ii) Sketch and describe the construction of a centrifugal pump, labelling its parts. What is a 'lantern ring' and why is it fitted? (10)
2023/NOV/Q8 **2023/DEC/Q5** **2025/SEP/Q5**
Click Here to See the Answer

Q6. Explain the following terms and give examples of where each condition might occur:
(a) Stress Corrosion cracking (6)
(b) Creep cracking (5)
(c) Corrosion fatigue (5)
2022/OCT/Q1 **2023/DEC/Q6** **2024/MAY1/Q8** **2024/OCT/Q8** **2025/JUL/Q8** **2025/SEP/Q6**
Click Here to See the Answer

Q7. a) What are the safety devices fitted to an Air Compressor? (4)
b) What is the purpose of the Scum Valve on a Boiler? (4)
c) What is the function of an evaporator in a Refrigeration System? (4)
d) Regarding the Emergency Bilge Injection Valve, what is its relevant size compared to the Main Sea Water Injection Valve? (4)
2022/DEC/Q8 **2022/OCT/Q6** **2023/APR/Q8** **2023/DEC/Q7** **2025/SEP/Q7**
Click Here to See the Answer

Q8. (a) Sketch a two-ram type hydraulic steering gear with a single Electro-hydraulic pumping unit. Show
the hunting gear arrangement and indicate valve positions (8)
(b) State the purpose of, and describe the operation of:

(i) Hydraulic shock/buffer valves (3)
(ii) Oil replenishing tank (2)
(iii) Hunting gear (3)
2022/OCT/Q8 **2023/DEC/Q8** **2024/MAY2/Q2** **2024/SEP1/Q2** **2025/MAR/Q2** **2025/AUG/Q2** **2025/SEP/Q8**
Click Here to See the Answer

Q9. a) Explain why air receivers should be drained frequently and its internal surfaces to be provided with protective coatings (6)
b) Describe the procedure for internal inspection of air receivers and the possible defects that may be encountered. Suggest suitable repair methods for the defects. (6)
c) Describe fault conditions associated with air receiver mountings and the remedies to rectify the same.
2022/DEC/Q3 **2023/DEC/Q9** **2025/SEP/Q9**
Click Here to See the Answer

OCTOBER – 2025

Q1. With reference to control system explain in brief,
a) Two step action. (6)
b) Proportional control. (5)
c) Offset. (5)
2023/AUG/Q5 **2024/JAN/Q1** **2024/SEP2/Q6** **2025/APR1/Q6** **2025/OCT/Q1**
Click Here to See the Answer

Q2) (a) Sketch a line diagram showing a typical 'Inert Gas System' used for inerting the cargo tanks of oil tankers, labelling the component parts (8)
(b) Describe the system (8)
(c) State what oxygen content you would expect in the flue gases if good combustion is achieved
2024/JAN/Q2 **2024/APR2/Q8** **2025/JAN2/Q8** **2025/OCT/Q2**
Click Here to See the Answer

Q3. (a) Why Engineering Materials are tested prior manufacturing of their components. (6)
(b) Describe the various 'destructive' and 'non-destructive' tests carried out on materials for shipboard used.
Explain the purpose of each test and where the same applied. (10)
2023/FEB/Q1 **2024/JAN/Q3** **2024/SEP2/Q7** **2025/APR1/Q7** **2025/OCT/Q3**
Click Here to See the Answer

Q4. With reference to a typical shipboard refrigeration system:
a) Sketch the arrangement which controls superheat temperature of refrigerant gas leaving the evaporator. (8)
b) Describe the operation of the arrangement sketched in (a) assuming one of the HFC refrigerants is the working medium. (4)
c) Explain the purpose of the equalizing connection. (4)
2024/JAN/Q4 **2025/OCT/Q4**
Click Here to See the Answer

Q5. With regard to keeping the gas side of boilers in good condition, Discuss EACH of the following.
1. The mechanism of combustion, stating the factors which are important to good combustion. (6)
2. Oil fuel treatment (5)
3. Soot removal equipment (5)
2022/OCT/Q7 **2022/DEC/Q9** **2023/APR/Q9** **2024/JAN/Q5** **2025/OCT/Q5**
Click Here to See the Answer

Q6. Explain why regular testing of water in auxiliary boilers is desirable. For each, test normally carried out, state,
a) Reasons for making the test (6)
b) Acceptable values for any particular type of auxiliary boiler (5)
c) Action required when measured values differ appreciably from desired values. (5)
2022/SEP/Q1 **2024/JAN/Q6** **2025/OCT/Q6**
Click Here to See the Answer

Q7. With reference to electric arc welding:
a) Draw a labeled sectional sketch of a satisfactory butt weld. (5)
b) Briefly define the following defects that may occur and how they may have been caused (6)
i) Under cut
ii) Splatter
iii) Inclusion
iv) Blow hole
v) Incomplete root penetration
vi) Lack of fusion
c) Why is alternating current generally more popular then direct current for metal arc welding? (5)
2022/AUG/Q3 **2022/SEP/Q6** **2023/JUN/Q8** **2023/JAN/Q5** **2023/MAY/Q3** **2023/OCT/Q3** **2024/JAN/Q7** **2025/OCT/Q7**
Click Here to See the Answer

Q8. Compare the desirable qualities of the lubricating oil selected for each of the following duties and give reasons for the differing properties of the oils recommended for these three purposes. (16)
a) Auxiliary diesel engines
b) Stern tube bearings
c) Refrigeration compressors
2022/SEP/Q8 **2024/JAN/Q8** **2025/OCT/Q8**
Click Here to See the Answer

Q9. Reverse osmosis is the contemporary alternative for shipboard production of drinking water.
a) Describe using simple diagrams where necessary, the principle of: -
i) Osmosis (3)
ii) Reverse osmosis (3)
b) Sketch a line diagram showing a 'single pass system' for producing fresh from seawater. (4)
i) Describe such a system. (4)
ii) State the safety features that may be incorporated into the plant. (2)
2022/AUG/Q2 **2023/JUN/Q7** **2023/OCT/Q2** **2024/JAN/Q9** **2025/OCT/Q9**
Click Here to See the Answer

NOVEMBER – 2025

Q1. a) How does heat treatment affect the properties of metals? Discuss common heat treatment processes. (6)
b) Describe the factors that influence the corrosion of metals and methods of prevent corrosion. (6)
c) What are the factors that affect the mechanical properties of materials, such as hardness, toughness, and ductility? (4)
2025/NOV/Q1
Click Here to See the Answer

Q2. Make a diagrammatic sketch of an exhaust gas boiler. Describe its construction and explain how it is maintained in an efficient condition (16)
2023/AUG/Q9 **2024/JUL/Q2** **2025/JAN1/Q2** **2025/NOV/Q2**
Click Here to See the Answer

Q3. Explain the following briefly with reference to a domestic refrigeration system on board a ship. (16)
(a) Ingress of air into the freon system.
(b) Loss of refrigerant from a condenser.
(c) Water in the freon system.
(d) Icing of condenser external surface.
2024/JUL/Q3 **2025/JAN1/Q3** **2025/NOV/Q3**
Click Here to See the Answer

Q4. (a) Sketch a water-tight door and frame showing manner of attachment to bulkhead and the additional reinforcement carried by the bulkhead to compensate for the aperture (8)
(b) Explain how watertightness of the door and frame mating surface is ensured with a hydrostatic pressure tending to force the faces apart. (4)
(c) Describe the means of remote closing operation of the door and state how many closing stations there are and their position. (4)
2024/JUL/Q4 **2025/JAN1/Q4** **2025/NOV/Q4**
Click Here to See the Answer

Q5. Sketch and explain the construction of a feed Check Valve. Why is it known as double shut off
arrangement. (16)
2024/JUL/Q5 **2025/JAN1/Q5** **2025/NOV/Q5**
Click Here to See the Answer

Q6. with reference to auxiliary boiler water impurity define the effects of the following salts: (16)
(a) Calcium carbonate,
(b) Sodium chloride,
(c) Magnesium chloride,
(d) Calcium sulphate
Explain how the quantity of each is determined and controlled.
2024/JUL/Q6 **2025/JAN1/Q6** **2025/NOV/Q6**
Click Here to See the Answer

Q7. Write short notes on the following:
(a) Ultrasonic testing (8)
(b) Shaft earthing device (8)
2024/JUL/Q7 **2025/JAN1/Q7** **2025/NOV/Q7**
Click Here to See the Answer

Q8. (a) Sketch a screw displacement pump and explain its operation (10)
(b) State the factors which affect its efficiency. (6)
2024/JUL/Q8 **2025/JAN1/Q8** **2025/NOV/Q8**

Q9) With reference to main air reservoirs:
(a) Explain with line sketch the manner in which mountings are attached to the shell (6)
(b) Explain why regular internal inspection is advisable (4)
(c) What inspection and maintenance you will carry out an air reservoir (6)
2024/APR1/Q7 **2024/JUL/Q9** **2024/AUG/Q7** **2025/JAN1/Q9** **2025/NOV/Q9**
Click Here to See the Answer

DECEMBER – 2025

Q1. (a) What is meant by the term 'purification' and what does it 'separate'?
(b) What are the basic methods of 'separation'? Explain the functioning of 'purifier' and 'clarifier'? (3)
(c) What is meant by the term 'interface' and what is the role of 'gravity disc' in determining the same?
(d) What is 'NOMOGRAM' and how is the correct 'gravity disc' size selected?
2023/MAR/Q4 **2024/FEB/Q1** **2024/DEC2/Q1** **2025/DEC/Q1**
Click Here to See the Answer

Q2. (a) Draw a simple line sketch of a 'shell and tube' cooler, clearly labelling its parts. (6)
(b) Describe the system. (4)
(c) Name common defects found. (3)
(d) What periodical maintenance needs to be carried out. (3)
2023/MAR/Q6 **2024/FEB/Q2** **2024/DEC2/Q2** **2025/DEC/Q2**

Q3. (a) What is meant by the term 'corrosion' and how does it occur in nature? (6)
(b) Name different types of 'wet and dry corrosion' (at least 4 of them) with brief account of their occurrence and suitable preventive measures for their control.
2023/MAR/Q3 **2023/SEP/Q3** **2024/FEB/Q3** **2024/DEC2/Q3** **2025/DEC/Q3**
Click Here to See the Answer

Q4. Write short notes on the following pertaining to the use of copper alloys in seawater systems.
(a) use of copper nickel and formation of protective film for use in seawater.
(b) Cavitation (4)
(c) Dezincification (4)

(d) Marine Biofouling (4)
2023/MAR/Q1 **2023/SEP/Q1** **2024/FEB/Q4** **2025/DEC/Q4**
Click Here to See the Answer

Q5. (a) Name the safety devices fitted on 2 Stage air compressors on ships. Explain their functional
purpose as well as location of fitment, using a schematic diagram. (12)
(b) State the maintenance and checks carried out periodically in order to keep them efficient. (4)
2023/MAR/Q8 **2024/FEB/Q5** **2024/DEC2/Q5** **2025/DEC/Q5**
Click Here to See the Answer

Q6) (a) Describe the constructional features of plate type freshwater generator and its operational procedures for freshwater generation. (6)
(b) State the temperatures and pressures at salient points. (4)
(c) State some of the advantages and limitations that exist in using a plate type heat exchanger. (6)
2022/JUL/Q2 **2022/NOV/Q2** **2023/APR/Q2** **2024/FEB/Q6**
2024/APR1/Q2 **2024/SEP2/Q1** **2024/DEC2/Q6** **2025/FEB/Q2**
2025/APR1/Q1 **2025/DEC/Q6**
Click Here to See the Answer

Q7. (a) Why is heat treatment necessary for carbon steel? (6)
(b) Describe the various heat treatment processes and their benefits. (10)
2022/JUL/Q5 2022/NOV/Q1 **2023/APR/Q1** **2024/FEB/Q7**
2024/DEC2/Q7 **2025/DEC/Q7**
Click Here to See the Answer

Q8. (a) Describe the functional components of a reefer plant for the domestic refrigeration system and temperatures to be maintained in different cold rooms. (8)
(b) In reference to a domestic refrigeration system briefly describe the following: (8)
(i) Pressure switches

(ii) Tubular heat exchangers
(iii) Oil Separator
(iv) Drier system
2022/JUL/Q4 **2022/NOV/Q5** **2023/APR/Q5** **2023/SEP/Q5** **2024/FEB/Q8** **2024/DEC2/Q8** **2025/DEC/Q8**
Click Here to See the Answer

Q9. a) Sketch and describe a biological sewage treatment system. (6)
b) How does the biological Sewage Treatment Plant work? Explain. (6)
c) What Is understood by the term BOD? What factors affect BOD. (4)
2023/APR/Q6 **2023/SEP/Q6** **2024/FEB/Q9** **2024/DEC2/Q9** **2025/DEC/Q9**
Click Here to See the Answer