D. MARINE
Study Material

MEO CLASS 2 WRITTEN: EKG

(ENGINEERING KNOWLEDGE GENERAL)

FOR INDIAN COMPETENCY EXAM

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Study Material

JAN-2023

1. With respect to properties of fuel oil, explain the significance of the following terms.
(a) Calculated Carbon Aromaticity Inbox (CCAI)
(b) Open flash point and Closed flash point.
(c) The importance of Sodium to Vanadium Ratio.
(d) Octane Number.
2021/FEB/01 **2021/NOV/02** **2022/MAR/03** **2022/JUN/02**
2023/JAN/01 **2023/OCT/01** **2024/APR/02** **2025/AUG/02**
Click Here to See the Answer

2. a) Materials used for hull and machinery are subject to stress and strain in service. Define EACH of the following:
(i) Types of stress
(ii) Types of strain
(b) Describe the tests that may be carried out on steel to be used for ships side plating.
2021/JUL/01 **2024/OCT/01**
Click Here to See the Answer

3. Reverse osmosis is the modern alternative for shipboard production of drinking water.
a. Describe using simple diagrams, if necessary, the principle of reverse osmosis.
b. Sketch a line diagram showing a single pass system for producing fresh water from sea water
C. Describe such a system
2023/JAN/03 **2025/JUL/04** **2025/AUG/06**
Click Here to See the Answer

4.With respect to refrigeration gases used onboard vessels, answer the following-
A. Explain ozone depleting potential of conventional refrigerant gases

B. Name the alternate refrigerant gases available and being used onboard.
C. Explain the steps you will take to ensure that release of refrigerant gases from the plant is minimized during normal operation and during maintenance activities.
2021/DEC/05 **2022/MAR/07** **2021/JUL/08** **2015/NOV/06** **2023/JAN/04** **2023/MAR/03** **2023/JUN/02** **2024/JUL/05** **2025/NOV/05**
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5.a) Describe a transverse bow thrust unit using a controllable pitch propeller. Mention should be made of how it is supported and how the strength of thrust and reverse thrust is achieved.
b) State with reasons, a suitable prime mover for the controllable pitch propeller.
c) State whether the thrust unit delivers a relatively low-pressure head with high volume output/ or high-pressure head with low volume output.
2021/JAN/05 **2021/JUL/05** **2023/JAN/05**
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6.Explain the working principle of differential Pressure Transmitter with the help of diagram and explain the following parts with their usages
A Zero and span calibration
B. Negative feedback bellow
C. Pilot amplifier functions
D. Zero Elevation Concept
2023/JAN/06 **2024/FEB/01** **2025/JAN/06**
Click Here to See the Answer

7. With reference to sleeved keyless propeller assemblies:
a) State, with reasons, the metals used in the manufacture of the sleeve and tail end shaft:
(II) State the type and thickness of material used to bond the sleeve to the propeller boss.
(b) When removing the propeller from the tail end shaft, state why the following procedures are not recommended:

(i) Application of push off force by means of wedges or jacks and draw off force by strong back;
(ii) Expansion of propeller boss by concentrated local heating with gas torches.
(c) State the correct procedure for removal of the propeller from the tail end shaft
2022/AUG/07 **2023/JAN/07**
Click Here to See the Answer

8. Explain why a material may fracture when stressed below its yield point. Give examples of components which might fracture in this way if suitable precautions are not taken. Explain how such fractures can be avoided with reference to the materials chosen, careful design and workmanship
Click Here to See the Answer

9. With reference to electro-hydraulic steering gears:
A. Explain in terms of control parlance, the function of the "Hunting gear";
B. Explain the consequences if the standby pumping unit is motored;
C. State TWO methods employed to prevent the standby hydraulic pump being motored by the operating unit.
Click Here to See the Answer

FEB - 2023

1. With reference to the carriage and pumping of liquefied gas cargo:
a) Sketch a suitable pumping system labeling the component parts
b) State, why submerged hydraulically driven pumps are not used
c) How overheating of pump drive shaft bearings is avoided.
d) State, how the risk of fire and explosion in cargo tanks is obviated both in the loaded and discharged condition.
2023/FEB/01 **2023/SEP/03** **2025/JAN/03**
Click Here to See the Answer

2. a) Explain the ideal design requirements of a ship's propeller.
b) briefly describe the propeller maintenance that should be carried out to prevent the fuel being wasted.

2022/DEC/05 **2023/FEB/02** **2023/JUL/05** **2023/NOV/05**
2024/JAN/05 **2025/JAN/05** **2025/SEP/05**
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3.a) Explain with sketch the operation of an automatic expansion valve as fitted in the direct expansion refrigeration plants. How is this valve adjusted?
b) Explain how critical temperature restricts plant operation and how these limitations can be overcome?
c) Explain how this system maintains the provision rooms at different temperatures?
2022/OCT/08 **2023/FEB/03** **2024/AUG/02** **2025/MAR/07**
Click Here to See the Answer

4. With reference to hull cathodic protection systems of the impressed current type:
(a) Sketch and describe such a system:
(b) Explain now protection may be ensured for the rudder and propeller.
(c) State any precautions that should be taken when this type of system is installed.
2023/FEB/04 **2023/OCT/08** **2025/FEB/06** **2025/OCT/06**
Click Here to See the Answer

5. Discuss the causes of vibration and noise in main gearing and describe detrimental effects on machinery and operating personnel How would you detect the sources) of this vibration and how might it be reduced to tolerable limits?
Click Here to See the Answer

6. a) Explain electro chemical reactions and the difference between oxidation and reduction electrochemical reactions with examples. Which reactions occurs at the anode and cathode?
b) Explain galvanic corrosion and discuss the different procedures to prevent it.
2022/NOV/09 **2023/FEB/06** **2023/APR/01** **2023/SEP/04**
2024/AUG/09 **2025/JAN/09**
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7.State why the temperature of lubricating oil supplied to an engine needs close control Sketch and describe an arrangement and explain the principle of operation of instrumentation and control equipment for automatically maintaining the temperature of lubricating oil supplied to an engine at its desired value.

2023/FEB/07 **2023/APR/09** **2024/OCT/04**

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8a) Sketch a simple cross section through a single stage centrifugal pump with a fully shrouded single entry impeller, name the components of the pump, and indicate the direction of fluid flow.
b) Describe:- i. The function of the impeller and how suction is created by it. ii .The function of the volute casing. iii. State the material of each component of the pump.
c) State the suction it that may be expected.
d) State why some centrifugal pumps have (i) A double volute casing. (ii) A diffuser ring

2023/FEB/08

Click Here to See the Answer

9. Misalignment of the main shafting between engine and propeller causes bearing overloads and shaft stress
(a) State the difficulties associated with checking shaft Alignment and the reasons why results are unreliable due to external factors
(b) Explain with a simple sketch how a bearing load is assessed.
(c) Explain how uneven leading could be rectified.

2021/AUG/04 **2022/FEB/04** **2024/MAR/05**

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MAR- 2023

1. With reference to fixed installations for dealing with a machinery space fire:
a) Describe with the aid of a sketch a typical installation.
b) Explain the testing procedure for the equipment.
c) Outline the testing procedure for

(i) remote shut down.
(ii) other equipment to be used in the event of an engine room fire.
2023/MAR/01
Click Here to See the Answer

2. a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels can have on an engine crankshaft.
(b) Explain how engine deterioration influences the risk of Torsional Vibration, stating what can be done to minimize that risk.
(c) Explain TWO possible reasons for the activation of a Torsional Vibration alarm after an engine has been started if there had been no previous history of such an alarm and if no maintenance had been undertaken on the engine whilst it was stopped.
2023/MAR/02
Click Here to See the Answer

3. with respect to refrigeration gases used on-board vessels, answer the following
A. Explain ozone depleting potential of conventional refrigerant gases.
B. Name the alternate refrigerant gases available and being used onboard.
C. Explain the steps you will take to ensure that release of refrigerant gases from the plant is minimized during normal operation and during maintenance activities.
2023/JAN/04 **2023/MAR/03** **2023/JUN/02** **2024/JUL/05** **2025/NOV/05**
Click Here to See the Answer

4. With respect to the steering gear, answer the following
a) Explain with a diagram, a "fail safe steering gear" suitable for use on a tanker of more than 100000 T dwt.
b) Explain the sequence of events that take place when an oil leak takes place in one of the hydraulic pipelines.
2023/MAR/04
Click Here to See the Answer

5. a) State why fixed pitch propellers have a poor efficiency when going astern.
b) With reference to controllable pitch propellers state
i) Why it is preferable that the main servomotor be housed in the propeller hub than in the shafting forward of the propeller shaft.
ii) What regular maintenance and checks should be carried out to ensure maximum reliability of the gear at all times,
2022/JAN/05 **2022/JUL/02** **2018/NOV/06** **2018/AUG/05** **2023/MAR/05** **2023/JUL/03**
Click Here to See the Answer

6. Hydrogen damage is a general term used for mechanical damage of metal caused by the presence of hydrogen, briefly discuss the different types of hydrogen damage and how these damages can be prevented?
a) Hydrogen blistering
b) Hydrogen embrittlement
c) Decarburization.
d) Hydrogen attack
2022/SEP/05 **2023/MAR/06** **2023/AUG/06** **2024/MAR/06** **2025/FEB/09**
Click Here to See the Answer

7 Sketch an arrangement of propeller shaft and stern tube in which the tube is filled with oil and
a) Describe Die attention it requires at sea
b) Suggest a method of repair when the rubbing surfaces of the oil seal get badly worn
out
c)State the defects that you would look for when the shaft is withdrawn in the dry-dock.
2023/MAR/07
Click Here to See the Answer

8. Sketch and describe a valve suitable for reducing air pressure and maintaining the reduced pressure within close limits. Describe the processes

through which air from the starting air receivers should be treated before it is used in a pneumatic control system.

2023/MAR/08 **2023/NOV/02** **2024/SEP/04**

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9. How is the power to weight ratio of an engine sought to be increased by continuous development. Discuss the limiting factors. What is the typical power to weight ratio of a slow speed marine diesel engine of current generation?

Click Here to See the Answer

APR - 2023

1. a) Explain electro chemical reactions and the difference between oxidation and reduction electrochemical reactions with examples. Which reactions occurs at the anode and cathode?

B) Explain galvanic corrosion and discuss the different procedures to prevent it.

Click Here to See the Answer

2. Discuss, with reference to the super heater outlet temperature of a main boiler operating at a constant load, the following statements

a) An increase in excess air will tend to cause a decrease in super heater outlet temperature due to the cooling effect of more air being introduced.

b) A decrease in economizer inlet temperature will tend to cause a decrease in super heater outlet temperature due to the cooling effect of more water being introduced.

c)Badly fouled generating tube banks will cause an increase in the super heater outlet temperature.

d) Excessive amounts of total dissolved solids in the boiler water will cause variations in the super heater outlet temperature.

Click Here to See the Answer

3.a) Briefly describe the operation of an electrical or hydraulic main engine governor. (R)

b) For the type described indicate how failure can occur and the action to be taken if immediate correction cannot be achieved and the engine must be operated.
Click Here to See the Answer

4.a) Describe with the aid of sketches where necessary vane type weering gear showing how the weight of the rueder and stock are carried and the arrangement that allow for wear down
b) State how the vanes described in tai are secured and the method of sealing the edges.
C) state how, if necessary, the steering gear is locked for rudder maintenance.
Click Here to See the Answer

Q5. A. Describe with the aid of a sketch, the main engine ancillary equipment for automatic monitoring and regulation of fuel viscosity. B. Explain the operation of equipment described in Q. (A). C. Discuss the single fuel concept.
Click Here to See the Answer
Q6. A. Describe the preparation necessary before the application (in dry dock) of sophisticated or approved long life coating to the underwater surface of the hull.
B. State the significance of the roughness profile.
C. List the different sophisticated coatings which are available.
Ans-A. Preparation for Applying Long Life Coating to the Underwater Surface of the Hull (in Dry Dock)
Click Here to See the Answer

7.a) Describe the precaution necessary during the initial running-in of an Auxiliary Engine run on which is newly installed or has a major overhaul.
b) Explain the possible causes of oxidation of lubricating oil.
Click Here to See the Answer

8.a) How is fuel oil injected into the cylinder of a heavy oil two stroke cycle internal combustion engine and how is it ignited? Show by a timing diagram at what point of stroke injection of the fuel begins and ends. Name the engine to which your answer refers.

b) Explain the effect of advancing the timing of injection on i Fuel per brake horse power hour; Exhaust temperature; Cylinder maximum pressure
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9. With reference to large, fabricated bed plates explain
a) With reason, why longitudinal strength and rigidity is important despite the contributions made by ship's structure.
b) With sketches show how the combustions loads imposed on piston and cylinder heads are transmitted to and absorbed by bed plates.
Click Here to See the Answer

JUN-2023

1.Cast Iron is most widely used after steel in Marine Engineering. Most cast iron consists of graphite in steel like matrix. Discuss the variation of properties that may arise with reference to pearlitic grey cast iron and spherical grey cast iron. Briefly describe the treatment necessary to produce these two types of Irons.
2022/FEB/02 **2022/APR/09** **2022/JUL/06** **2023/JUN/01** **2023/NOV/06** **2024/APR/01** **2025/JUL/02**
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2.With respect to refrigeration gases used on-board vessels, answer the following:
a) Explain Ozone Depleting Potential (ODP) and Global warming potential (GWP) of conventional refrigerant gases.
b) Name the alternate refrigerant gases available and being used onboard.
c) What steps are taken to minimize the release of refrigerant gases from the plant during normal operation and maintenance activities.
2023/JAN/04 **2023/MAR/03** **2023/JUN/02** **2024/JUL/05** **2025/NOV/05**
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3.Sketch a sealing arrangement for an oil lubricated stern tube and a) Identify the common form of seal failure
b) State how oil loss due to seal failure can be restricted whist on passage

c) What material is used for sealing ring and propeller shaft liner?
2023/JUN/03 **2023/AUG/01** **2024/APR/09**
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4.a) State the advantages of using steam turbine propulsion power for vessels carrying LNG cargo.
b). With regard to the use of L.N.G. cargo as boiler fuel explain:
(i)The safety precautions relating to the gas pipeline supplying the boiler and burning the gas in the boiler,
(ii) The means of getting rid of "excess gases" during loading or discharge.
2022/DEC/03 **2023/JUN/04** **2023/OCT/02** **2024/MAR/02**
2024/NOV/02 **2024/DEC/09** **2025/SEP/03**
Click Here to See the Answer

5. Misalignment of the main shafting between engine and propeller causes bearing overloads and shaft stress.
(a) State the difficulties associated with checking shaft alignment and the reasons why results are unreliable due to external factors.
(b) Explain with a simple sketch how a bearing load is assessed.
(c) Explain how uneven loading could be rectified.
2021/AUG/04 **2022/FEB/04** **2024/MAR/05**
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6. a) Sketch a line diagram showing the layout components of a hydraulic system with a variable delivery, Pressure compensated pump and accumulator, suitable for the operation of deck machinery.
b). Describe the operation of the system sketched in part.
2021/AUG/06 **2021/SEP/05** **2021/OCT/07** **2021/NOV/06**
2023/JUN/06 **2024/JUL/08** **2025/JUN/08**
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7. State, with reasons, how cracking in EACH of the following locations is ca,sed, rectified and avoided:
(a)'A' Frames
(c) Bed plate transverse girders.
(c)Bed plate longitudinal girders.

2021/APR/02 **2016/FEB/04** **2010/OCT/** **2023/JUN/07**
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8.With regards to main transmission shaft flange coupling arrangements:
a) Sketch a hollow type coupling bolt and the hydraulic head/nut and loading rod which are used to fit it.
b) Describe how the bolt is fitted.
c) State the advantage of the hollow coupling bolt as compared to the traditional type of coupling bolt.
2023/JUN/08 **2024/MAR/03** **2024/APR/05** **2025/JUL/08**
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9. With reference to Inert Gas Generator fitted on gas carriers:
a. Sketch a line diagram showing a typical "Inert Gas System' used for inerting in gas carriers, labeling the component parts.
b. Describe the system.
c. State the function of a chiller used in this type of inert gas generator.
2023/JUN/09 **2024/AUG/03**
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JUL-2023

1.Describe a three-element feed water controller (ie., regulator) measuring steam flow, drum level and feed water flow and explain what relationship is maintained between the three variables and how?
2023/JUL/01
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2. Sketch and describe a "fall safe steering gear" suitable for use on a tanker of more than 100,000 T dwt. Explain the sequence of events that take place when an oil leak takes place in one of the hydraulic pipelines.
Click Here to See the Answer

3.a) Why is the efficiency of fixed pitch propellers poor while going astern?
b) With reference to controllable pitch propellers:

i)What could be the reasons for housing the main servomotor in the propeller nub and not in the shafting forward of the propeller shaft?
How is the maximum reliability of the gear ensured?
2023/MAR/05 **2023/JUL/03**
Click Here to See the Answer

4 a) Describe the preparation necessary before the application (in dry dock) of sophisticated or approved long life coating to the underwater surface of the hull,
b) State the significance of the roughness profile
c) List the different sophisticated coating which are available.
2023/AUG/03 **2023/SEP/01** **2025/JUL/03**
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5.a) Explain the ideal design requirements of a ship's propeller.
b) Briefly describe the propeller maintenance that should be carried out to prevent fuel being wasted.
2022/DEC/05 **2023/FEB/02** **2023/JUL/05** **2023/NOV/05**
2024/JAN/05 **2025/JAN/05** **2025/SEP/05**
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6. a)State the laboratory tests that may be carried out on specimens of steel for ships plate giving reasons for the tests.
b)The basic compositions of two ships' plates are given in Table below. One is an example of modem practice whilst the other is a specification of a 1940's tanker that split in two due
to brittle fracture. Compare these two specifications critically and explain which of these two steels would be most resistant to brittle fracture.
NAIPSSIMS
Steel 'A' 0.18 0.
70% 0.30% 0.04% 0.04% 0,015% 0,005%
Steel
'B' 0.19% 0.57% 0.03% 0.029% 0.042% 0.005% 0.00
8%
2021/MAR/04 **2023/JUL/06**
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7. With respect to the refrigeration system on board vessels, answer the following.
a) Why are some TEVS fitted with an external equalising connection?
b) What is the purpose of a back pressure valve. What will the effect if it leaks?
c)How does an electronic TEV function?
2023/JUL/07 **2023/SEP/06** **2023/NOV/04** **2024/OCT/07**
Click Here to See the Answer

8 Discuss some of the factors which effect the shaft alignment of ships propulsion shafting Suggest the most effective methods adopted for achieving the best possible alignment?
Click Here to See the Answer

AUG-2023

1. Sketch a sealing arrangement for an oil lubricated stern tube; and
a) Identify the common forms of seal failure.
b) State how oil loss due to seal failure can be restricted whilst on passage?
c) What is the material used for sealing rings and propeller shaft liner?
2023/JUN/03 **2023/AUG/01** **2024/APR/09** **2024/DEC/04**
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2.a) Sketch a line diagram showing a typical 'Inert Gas System' used for inerting the cargo fanks of oil tankers, labelling the component parts.
b) Describe the system.
c) State what oxygen content you would expect in the flue gases if good combustion is achieved.
2021/JUL/09 **2021/SEP/02** **2023/AUG/02** **2025/AUG/08**
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3.With reference to a tubular heat exchanger; state the various types used on board a ship and explain with sketches how the construction, flow pattern, baffles, differ from each other depending upon the medium in use.

2023/AUG/03 **2024/JUL/04** **2025/FEB/04** **2025/JUN/04** **2025/OCT/04** **2025/NOV/04**

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4. Define the following types of non-destructive methods of testing:
a) Radiographic.
b) Ultrasonic
c) Magnetic particle.
d) Dye penetrant.
Give their advantages and disadvantages.

2023/AUG/04

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5. With reference to shaft alignment:
a) Explain the meaning of fair curve or rational alignment;
b) Shaft alignment is often verified using hydraulic jacks to obtain a simple graph.
Sketch such a graph, indicating the following:
(i) Static load: (ii) Hysteresis; (iii) Influence number;
c) Explain the limitations of checking shaft alignment solely by hydraulic jacking methods.

2022/DEC/08 **2023/AUG/05** **2024/JUN/04** **2024/DEC/07** **2025/SEP/08**

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6. Hydrogen damage is a general term used for mechanical damage of metal caused by the presence of hydrogen, briefly discuss the different types of hydrogen damage and how these damages can be prevented?
a) Hydrogen blistering
b) Hydrogen embrittlement.
c)Decarburization.
d)Hydrogen attack.

2022/SEP/05 **2023/MAR/06** **2023/AUG/06** **2024/MAR/06** **2025/FEB/09**

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7.a) Describe with aid of a line diagram the layout and components of a hydraulic system suitable for the operation of deck machinery.
b) Explain how the hydraulic system pressure is controlled assuming the use of a variable Delivery pump.
c)State which design of hydraulic motor is used in the system described in (a).
2021/AUG/06 **2021/SEP/05** **2021/OCT/07** **2021/NOV/06** **2023/JUN/06** **2024/JUL/08** **2025/JUN/08**
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8.Sketch and describe a "fail safe steering gear" suitable for use on a tanker of more than 100,000 T Dwt. Explain the sequence of events that take place when an oil leak takes place in one of the hydraulic pipe line
9.a) Detail the desirable properties of a refrigerant.
b) Make a table and compare following refrigerants for use in a provision cooling plant for a 50000 DWT Oil tanker R-22, R-134a.
Click Here to See the Answer

SEP-2023

Q1. A. Describe with the aid of sketches where necessary a vane type steering gear showing how to weight of the rudder and stock are carried and the arrangement that allow for wear down;
B. State how the vanes described in (A) are secured and the method of sealing the edges;
C. State how, if necessary, the steering gear is locked for rudder maintenance.
2023/APR/04 **2023/SEP/01** **2025/MAR/03**
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Q2. With respect to Windlass and deck Machinery:
(a) Describe the principle of coil-operated brake suitable for winches and other deck machinery.
(b) Explain with suitable sketches how the windlass is relieved of strain when riding at anchor.
2021/JAN/08 **2021/MAR/03** **2021/DEC/01** **2022/APR/04** – **2023/SEP/02** **2024/JAN/01**

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Q3. With reference to the carriage and pumping of liquefied gas cargo:
A. Sketch a suitable pumping system labelling the component parts;
B. State;
i) Why submerged hydraulically driven pumps are not used;
ii) How overheating of pump drive shaft bearings is avoided;
C. State, how the risk of fire and explosion in cargo tanks is obviated both in the loaded and discharged condition.

2023/FEB/01 **2023/SEP/03** **2025/JAN/03**

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Q4. (a) Explain electro chemical reactions and the difference between oxidation and reduction electrochemical reactions with examples. Which reactions occurs at the anode and cathode?
(b) Explain galvanic corrosion and discuss the different procedures to prevent it.

2022/NOV/09 **2023/FEB/06** **2023/APR/01** **2023/SEP/04**
2024/AUG/09 **2025/JAN/09**

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Q5. Damage has occurred to the main engine valves and the fuel supplied at a particular port is suspected. The owner's case, however, in the subsequent dispute may be weak because the fuel was ordered specifying only type and viscosity.
A. Apart from fuel specification, describe how you, as Second Engineer, should have assisted the owners' case when receiving the suspect fuel.
B. Describe the ISO fuel standard that is to be used when ordering bunker fuel.
C. Explain how the correct fuel standard is selected.
D. Suggest, with reasons, why particular mention should be made of certain elements that might not be included in the fuel standard.

2023/SEP/05 **2021/APR/03**

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Q6. With respect to the refrigeration system on board vessels, answer the following

a) Why are some TEVs fitted with an external equalizing connection?
b) What is the purpose of a back pressure valve. what will the effect if it leaks?
c)How does an electronic TEV function.
2023/JUL/07 **2023/SEP/06** **2023/NOV/04** **2024/OCT/07**
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Q7. Describe with a sketch a pneumatic relay and show how feedback can be achieved when such a relay is used in conjunction with a flapper mechanism.
2021/NOV/08 **2022/MAR/04** **2023/SEP/07** **2025/MAR/09**
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Q8. Discuss some of the factors which effect the shaft alignment of ships propulsion shafting. Suggest the most effective methods adopted for achieving the best possible alignment?
2023/JUL/08 **2023/SEP/08**
Click Here to See the Answer

Q9. With reference to main boiler super heater arrangements:
A. Compare the advantages and disadvantages of contra flow with parallel flow design.
B. Describe how the element tube banks are supported yet allow for expansion.
C. Describe how boiler carryover affects super heater effectiveness and condition.
Click Here to See the Answer

OCT-2023

1. With respect to the properties of fuel oil, explain the significance of the following terms
(a) Calculated Carbon Aromaticity index (CCAI)
(b) Open flash point and Closed flash point
(c) The Importance of Sodium to Vanadium ratio.
(d) Octane Number.

2021/FEB/01 2021/JUL/06 2021/OCT/01 2021/NOV/02 2022/MAR/03 2022/JUN/02 2023/JAN/01 2023/OCT/01 – 2024/APR/02 2025/AUG/02

Click Here to See the Answer

2. a) State the advantages of using steam turbine propulsion power for vessels carrying LNG cargo.
b) With regard to the use of LNG cargo as boiler fuel explain:
(i) The safety precautions relating to the gas pipeline supplying the boiler and burning the gas in the
(ii) The means of getting rid of "excess gases during loading or discharge.

2022/DEC/03 2023/JUN/04 2023/OCT/02 2024/MAR/02 2024/NOV/02 2024/DEC/09 2025/SEP/03

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3. Explain why a material may fracture when stressed below its vivid point. Give examples of components which might fracture in this way if suitable precautions are not taken Explain how such fractures can be avoided with reference to the materials chosen, careful design and workmanship.

Click Here to See the Answer

4. With respect to the survey of diesel main propulsion machinery by Classification Society:
(a) Explain the term Continuous Survey of Machinery (CSM).
(b) Explain how Class has reduced the need for attendance by the surveyor for some work .
(c) Describe how a planned maintenance scheme may be used to advantage with CSM.
(d) Describe TWO programs that are approved by the Class in order that physical opening up machinery is not necessary on every occasion.

2022/AUG/02 2023/OCT/04

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5. GHG Ratings of ships have become new industry norms- Discuss various types of GHG Ratings applied to international shipping, with a special focus on the role of Second Engineers in improving GHG ratings of ships,

2022/JUL/05 **2022/OCT/04** **2023/OCT/05** **2024/JAN/07**
2024/JUL/01 **2025/NOV/01**
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6. a) Explain the causes of the formation of mill scale on steel plate.
(b) Describe the preparation necessary before the application of conventional paints to the underwater surface of the hull.
(c)Describe a coating scheme for the underwater hull using conventional paints
2023/OCT/06
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7. Exhaust gas cleaning system is one of the system used on board ship to reduce SOX emissions-
(a) Briefly discuss various types of Exhaust gas cleaning system used on board ship.
(b) What all data to be monitored and recorded when EGCS is in use to ensure that system meets all IMO regulations
(c) What action you will take as second engineer if the system stopped working.
2022/AUG/04 **2022/NOV/04** **2023/OCT/07** **2025/FEB/07**
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8. With reference to hull cathodic protection systems of the impressed current type:
(a) Sketch and describe such a system;
(b) Explain how protection may be ensured for the rudder and propeller
(c) State any precautions that should be taken when this type of system is installed.
2023/FEB/04 **2023/OCT/08** **2025/FEB/06** **2025/OCT/06**
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9. With reference to Keyless Propellers:
(a) Sketch a section through a keyless sleeved propeller.
(b) State the advantages of using a keyless sleeved propeller.

(c)State with reasons, which metal sleeve, should be made for contact with the forged mild steel tail shaft.
(d)State the material uses to bond the sleeve to the propeller and the general thickness of the bonding material.
2023/OCT/09 **2023/DEC/07** **2024/JUN/03**
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NOV-2023

1. Sketch and describe a boiler water level controller of the float operated type. State the reasons for having this mechanism on the boiler and using the controller and boiler for analogy explain the following terms.
(a) Detecting element
(b) Servo motor
(c) Desired value
2021/FEB/04 **2022/JAN/03** **2022/JUN/07** **2023/NOV/01** **2024/NOV/07**
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2. Sketch, and describe a valve suitable for reducing air pressure and maintaining the reduced pressure within close limits. Describe the processes through which air from the starting air receivers should be treated before it is used in a pneumatic control system.
2023/MAR/08 **2023/NOV/02** **2024/SEP/04**
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3. Explain how the ingress of sea water is prevented in an oil lubricated stern bearing system. Should the system fail, describe the corrective action possible whilst the vessel is afloat State why two stern bearing oil header tanks are fitted in some instances?
2023/NOV/03 **2024/JUN/09** **2025/JAN/04**
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4. With respect to the refrigeration system on board vessels, answer the following
(i)Why are some TEVS fitted with an external equalising connection?

(ii) What is the purpose of a back pressure valve. What will the effect if it leaks?
(iii) How does an electronic TEV function?
2023/JUL/07 **2023/SEP/06** **2023/NOV/04** **2024/OCT/07**
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5a) Explain the ideal design requirements of a ship's propeller.
b) Briefly describe the propeller maintenance that should be carried out to prevent fuel being wasted.
2022/DEC/05 **2023/FEB/02** **2023/JUL/05** **2023/NOV/05**
2024/JAN/05 **2025/JAN/05** **2025/SEP/05**
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6.Cast iron is most widely used after steel in Marine Engineering. Most cast iron consists of graphite in steel like matrix. Discuss the variation of properties that may arise with reference to pearlitic grey cast iron and spherical grey cast iron. Describe briefly the treatment necessary to produce these two types of Irons.
2022/JUL/06 **2023/JUN/01** **2023/NOV/06** **2024/APR/01**
2025/JUL/02
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7.A shipping company is investigating the possibility of converting a vessel from a traditionally manned engine room to Unattended Machinery Space (UMS) operations.
As Second Engineer Officer sailing on the vessel, write a report to the Superintendent Engineer listing the essential requirements for UMS classification and any additional work required.
2023/NOV/07 **2024/NOV/08**
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8. With reference to main propulsion shaft systems:
a) describe a method of hydraulic jacking to check bearing loads.
b) sketch the Bearing Load versus Shift Lift Dial Gauge Reading graph obtained by the method described in part

(a), annotating the graph and how the characteristic of bearing load is obtained.
2023/NOV/08 **2024/AUG/05**
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9. With respect to Energy efficient running of ships
a) Sketch and explain the optimization of propeller hull interface flow devices and Improvement of propulsion efficiency
(b) sketch and explain the optimization of Auxiliary machinery using VFDs.
2021/SEP/07 **2022/FEB/07** **2023/NOV/09** **2024/JUN/05**
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DEC-2023

1 As second engineer onboard a tanker, describe the procedure for presenting a Main Boiler for survey by a classification society.
2021/MAR/01 **2020/OCT/04** **2020/MAR/04** **2017/APR/01**
2023/DEC/01 **2024/APR/04** **2025/MAR/05**
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2 With reference to Automatic sprinkler systems for firefighting purposes:
(a) Explain, with the aid of a Heat Release versus Time diagram, the difference between fire control and fire suppression
(b) State the limitations of using glass bulbs to activate sprinkler heads and suggest, with reasons, an alternative mechanism.
(c) The safety devices incorporated in the system.
(d) The parameters governing the volume of the pressure tank.
2022/SEP/01 **2023/DEC/02**
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3 (a) Detail the desirable properties of a refrigerant.
(b) Make a table and compare following refrigerants for use in a provision cooling plant for a 50000 DWT Oil tanker: R-22, R-134a.
Click Here to See the Answer

4 Describe the importance of maintaining the quality of lube oil in maintaining the proper health of marine diesel engines highlighting the role of:
(a) Automatic back flushing filters
(b) Lube oil separators
(c) Magnetic filters
(d) Visual Inspection
(e) Periodic laboratory tests
2023/DEC/04 **2025/AUG/01**
Click Here to See the Answer

5 (a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels can have on an engine crankshaft.
(b) Explain how engine deterioration influences the risk of Torsional Vibration, stating what can be done to minimize that risk.
(c) Explain TWO possible reasons for the activation of a Torsional Vibration alarm after an engine has been started if there had been no previous history of such an alarm and if no maintenance had been undertaken on the engine whilst it was stopped.
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6 (a) Describe, with the aid of a sketch, an external system for reducing engine NOx emissions, explaining the chemistry of the process.
(b) Explain why Urea is used in the Selective Catalytic Reduction process instead of ammonia.
(c) Explain why the exhaust gas quality must be monitored before and after the Selective Catalytic Reduction unit, stating how such monitoring influences operation of the SCR unit
2023/DEC/06 **2024/SEP/06**
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7 With reference to Keyless Propeller.
(a) Sketch a section through a keyless sleeved propeller.
(b) State the advantages of using a keyless sleeved propeller.

(c) State with reason, Which metal sleeve should be made for contact with the forged mild steel tail shaft?
(d) State the material uses to bond the sleeve to the propeller and the general thickness of the bonding material.
2023/OCT/09 **2023/DEC/07** **2024/JUN/03**
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8 Sketch and describe a "fail safe steering gear" suitable for use on a tanker of more than 100,000 T dwt; Explain the sequence of events that take place when an oil leak takes place in one of the hydraulic pipe lines
Click Here to See the Answer

9 With reference to fatigue of engineering components
(a) Explain the influence of stress level at cyclical frequency on expected operating life.
(b) Explain the influence of material defects on the safe operating life of engineering component
(c) State the factors which influence the possibility of fatigue cracking of an auxiliary boiler feed water.
2024/DEC/05
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