



# UK MARINE TRAINING CENTRE (UMTC)

SAI POOJA BUILDING, SHOP NO. 4, PLOT NO. 36, SECTOR - 34. KAMOTHE, NAVI  
MUMBAI - 410 209 MAHARASHTRA, INDIA.

EMAIL : umtcindia1234@gmail.com | PH : +91 9673855053, +91 7021406134

## March 2014

Attempt TEN questions only as follows

SIX questions from each section A

TWO questions from section B

TWO questions from section C

Marks for each part question are shown in brackets.

### SECTION A

Q1. With reference to bacteria harmful to humans in drinking and washing water:

(a) state the constraints placed on the installation and use of systems for shipboard production of fresh water; (3)

(b) state the maintenance and treatment recommended for fresh water tanks; (3)

(c) describe how the entire fresh water system can be made free from bacteria; (3)

(d) state an acceptable residual value in the fresh water tanks to ensure the correct concentration of treatment in the system. (1)

2013/Mar	2014/Mar	2015/July	2016/ Dec	2017/Oct		
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Q2. With reference to pneumatic control valves:

(a) sketch a reverse acting control valve; (6)

(b) explain why a reverse acting arrangement would be used, stating ONE application for this valve. (4)

2014/March					
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Q3. With reference to the metallurgy of plain carbon steel:

(a) sketch an iron carbon equilibrium diagram, labelling the salient points;(6)

(b) explain EACH of the following terms:

(i) austenite: (2)

(ii) cementite. (2)

2014/Mar							
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Q4. With reference to refrigeration systems:

(a) explain why undercooling of the refrigerant at the condenser outlet is desirable;  
(3)

(b) describe, with the aid of a sketch, how a heat exchanger could be incorporated in the circuit to enhance undercooling; (5)

(c) explain the possible consequences of the refrigerant having a dryness fraction at the compressor suction. (2)

2014/March	2014/July	2016/Oct	2018/Mar				
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Q5. With reference to multi-tubular heat exchangers, explain how EACH of the following contribute to satisfactory performance:

(a) tube wall thickness;(2)

(b) dense population of tubes in the tube plate;(2)

(c) tube materials selection;(2)

(d) coolant flow rates;(2)

(e) unimpeded passage of coolant at entry and exit from the tubes. (2)

2014/Mar							
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Q10. (a) Explain why it is necessary to provide reverse power protection for a.c. generators operating in parallel. (2)

(b) Sketch a generator protecting circuit. (5)

(c) Explain how to check the operation of the reverse power trip. (3)

2014/Mar	2018/July	2018/Mar					
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Q11. Describe, with the aid of a block diagram, the operation of a load sensing electronic governor controller for an a.c. generator. (10)

2014/March	2015/July	2017/July							
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## SECTION - C

**Attempt TWO questions only from this section**

Q.12. (a) State why the International Maritime Organisation has banned the use of Tributyltin antifouling (T.B.T.) coatings for ship's hulls. (1)

(b) State the base elements of TWO alternative coatings to T.B.T. antifouling. (2)

(c) Explain the considerations in the selection of a coating for a ship's underwater surface. (7)

2014/March						
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Q.13. (a) Define propeller slip, explaining how it is calculated. (2)

(b) State, with reasons, FOUR conditions which will affect the propeller slip. (8)

2014/Mar	2017/Dec					
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Q.14. Describe, with the aid of sketches, how main propulsion efficiency can be improved by the addition

of EACH of the following:

- (a) ducted propeller (Kort nozzle) ;(5)
- (b) vane or Grim wheel aft of the propeller. (5)

2014/Mar	2017/March					
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## July 2014

Attempt TEN questions only as follows

SIX questions from each section A

TWO questions from section B

TWO questions from section C

Marks for each part question are shown in brackets.

### SECTION A

Q1. Describe, with the aid of a graph, EACH of the following types of ferrous material failure, stating ONE practical example of EACH:

1. creep; (5)
2. fatigue. (5)

2014/July	2016/Oct	2017/Dec				
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- Q2. 2(a) Explain how power is transmitted through main propulsion shafting. (3)
- (b) State THREE operational factors that may induce high stress in shaft coupling bolts. (3)
- (c) Sketch a hydraulic type of shaft coupling bolt. (4)

2014/July	2015/July	2015/Oct	2018/ Dec				
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- Q3. Describe the principle of operation of a biological sewage treatment plant. (4)
- (b) Explain how anaerobic conditions can occur within a sewage treatment plant, stating the hazards that may be encountered. (4)
- (c) Explain the meaning and significance of the term biological oxygen demand. (2)

2014/July							
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Q4. (a) Describe, with the aid of a sketch, the principle of operation of a thermodynamic steam trap. (8)

(b) Explain why steam traps fitted to bunker heating coils should always be maintained in good working condition. (2)

2014/July							
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Q5. With reference to the carriage and pumping of liquefied gas cargoes:

(a) sketch a deep-well pump, labelling the principal components; (6)

(b) state how the drive shaft bearings of the pump sketched in part (a) are cooled and lubricated; (1)

(c) explain how the risk of fire and explosion in the cargo tanks is countered both in the loaded and unloaded condition. (3)

2014/JULY							
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Q6. (a) Sketch the hydraulic circuit for a ram type steering gear that complies with the single failure concept and automatic isolation. (6)

(b) Describe how automatic isolation, for the hydraulic circuit sketched in part (a), is achieved within 45 seconds should leakage of system oil occur. (4)

2014/July	2015/Dec	2018/Mar			
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Q7. With reference to refrigeration systems:

(a) explain why undercooling of the refrigerant at the condenser outlet is desirable; (3)

(b) describe, with the aid of a sketch, how a heat exchanger could be incorporated in the circuit to enhance undercooling; (5)

(c) explain the possible consequences of the refrigerant having a dryness fraction at the compressor suction. (2)

2014/Mar	2014/JULY	2016/Oct	2018/Mar			
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Q8. When a vessel is in dry dock, the possible risks of fire in the machinery spaces are heightened due to the nature of the work being carried out.

As Chief Engineer Officer, compile a set of standing orders instructing ship's staff on the actions to be taken should a serious fire occur. (10)

2014/July	2018/Dec								
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## SECTION – B

Q9. 9. With reference to overcurrent protection for electrical circuits:

(a) explain THREE methods of protection, stating where EACH may be used; (6)

(b) explain, with the aid of a diagram, the meaning of the term inverse current time characteristic. (4)

2014/July	2018/Dec						
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Q10. Explain, with the aid of a circuit diagram, the operation of a star/delta starter for a polyphase motor, including the ancillary starter circuit. (10)

2014/July							
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Q11. 11. With reference to testing High Voltage equipment:

(a) explain why earthing down is considered essential; (2)

(b) state the operating voltage for an insulation resistance tester (meggar) suitable for 6.6 KV equipment; (1)

(c) describe how an insulation resistance test is carried out on High Voltage equipment, making reference to personnel safety; (5)

(d) explain why infra-red temperature measurement is used on High Voltage equipment. (2)

2014/July							
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## SECTION -C

Q12. With reference to roll reduction systems, explain the principles of operation of EACH of the following, stating the advantages and disadvantages of EACH:

(i) Bilge keels (5)

(ii) Passive Uncontrolled Tanks (5)

2014/July	2015/Dec	2016/July	2018/Mar				
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Q13. With reference to the classification of ships, explain EACH of the following:

(a) why ships are built to classification society rules; (5)

(b) the meaning of the notation 100A1; (4)

(c) how a ship remains in class throughout the life of the vessel. (1)

2014/July							
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Q14. With reference to cargo hatch covers on large container ships:(a) describe how they are tested for water tightness; (2)

(b) explain how the weight of the hatch and containers is transferred to the ship's structure whilst allowing for deflections of the hull in a seaway; (3)

(c) describe, with the aid of a sketch, the type and location of damage that can occur due to wear of the hatch supporting arrangements. (5)

2014/July							
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## October 2014

Attempt TEN questions only as follows

SIX questions from each section A

TWO questions from section B

TWO questions from section C

Marks for each part question are shown in brackets.

### SECTION A

Q1. With reference to a ship's air conditioning plant:

- (a) define the term comfort zone; (2)
- (b) state the objectives of maintaining the conditioned air within the comfort zone; (3)
- (c) state, with reasons, FIVE areas from which the conditioned air must not be recirculated. (5)

2014/Oct								
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Q 2. With reference to automatic control valves for EACH of the following valve plugs shown on Datasheet Q2:

- (a) draw the flow characteristics; (3)
- (b) describe and name the valve type; (4)
- (c) state a suitable application for each. (3)

2014/Oct								
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Q 3. The steering gear operation of a vessel that recently experienced a heavy storm is found to be abnormally sluggish.

- (a) State FIVE reasons for possible malfunction of the gear. (5)
- (b) State the corrective actions that may be carried out at sea, that will allow the vessel to continue to the nearest port. (5)

2014/Oct	2016/Oct	2019/Dec						
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Q4.(a) As Chief Engineer, explain the verifications and checks you should carry out to ensure the compliance to Classification Society requirements. (6)

(b) As Chief Engineer, state the maintenance and regular checks to be carried out. (4)

2014/Oct						
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Q5. 5.(a) Describe a vacuum sewage system. (5)

(b) List the advantages of the system described in part (a). (4)

(c) State why untreated sewage should not be allowed to stagnate. (1)

2014/Oct						
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Q6. 6.With reference to main propulsion shaft systems:

(a) describe a method of hydraulic jacking to check bearing loads; (5)

(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. (5)

2014/Oct	2018/Mar					
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Q7. (a) State the affinity laws for a centrifugal pump. (3)

(b) State the effects on the pump affinity laws of fitting a slightly smaller diameter impeller. (2)

(c) Explain, with the aid of a Head versus Flow diagram, why a two speed pump is preferable to throttling where high and low capacities are demanded for a large sea water circulating pump. (5)

2013/July	2014/Oct	2018/Mar				
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Q8. Explain, with the aid of a sketch, the principle of the combustion process in ships auxiliary boiler furnace utilising heavy fuel oil. (10)

2014/Oct						
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## SECTION – B

Q9. With reference to star delta starters used for three phase induction motors:

(a) explain in detail why this type of starter is employed;

(4)

(b) explain, with the aid of a circuit diagram, the sequence of operation of a star delta starter. (6)

2014/Oct						
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Q10. With reference to testing High Voltage equipment:

(a) explain why earthing down is considered essential; (2)

(b) state the operating voltage for an insulation resistance tester (meggar) suitable for 6.6 KV equipment; (1)

(c) describe how an insulation resistance test is carried out on High Voltage equipment, making reference to personnel safety; (5)

(d) explain why infra red temperature measurement is used on High Voltage equipment. (2)

2014/Oct						
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Q11. With reference to large electrical transformers on board ships:

(a) state where these transformers may be used; (1)

(b) state a typical efficiency range for a transformer; (1)

(c) state the regulations pertaining to transformers; (3)

(d) state the protective devices that are fitted; (2)

(e) describe the maintenance requirements. (3)

2014/Oct						
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## SECTION –C

Q12. (a) With reference to bilge keels:

(i) describe how the design and method of attachment reduces the possibility of damage to the shell plate; (5)

(ii) state what testing must be carried out. (2)

(b) Explain why the bilge keels do not extend the full length of the vessel. (3)

2014/Oct							
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Q13. As Chief Engineer officer, write a dry dock specification for the repair of the following damage that has occurred, stating what factors have to be considered when costing the repairs. Damage to water ballast tank number 1 port wing. The shell plating 15 mm thick for approx 2 metres square has to be removed and replaced along with the relevant damaged stiffeners. (10)

2014/OCT							
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Q14. With reference to cargo hatch covers on large container ships:

(a) describe how they are tested for weathertightness; (2)

(b) explain how the weight of the hatch and containers is transferred to the ship's structure whilst

allowing for deflections of the hull in a seaway; (3)

(c) describe, with the aid of a sketch, the type and location of damage that can occur due to wear of

the hatch supporting arrangements. (5)

2014/July	2014/Oct	2017/Oct						
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## December 2014

Attempt TEN questions only as follows

SIX questions from each section A

TWO questions from section B

TWO questions from section C

Marks for each part question are shown in brackets.

Q1. (a) Describe, with the aid of sketches, how the test pieces for a Class 1 pressure vessel are obtained. (6)

(b) List the tests which are carried out on the test pieces described in part (a). (4)

2014/Dec	2016/Dec	2019/July				
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Q2. With reference to automatic control:

(a) sketch a pneumatic proportional plus integral controller; (6)

(b) explain the term integral saturation; (2)

(c) explain the action to be taken by the operator in the event of integral saturation occurring. (2)

2014/Dec						
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Q3. (a) Sketch a muff type propeller shaft coupling. (5)

(b) Describe the actions to be taken if the coupling sketched in part (a) does not readily disconnect during routine tail shaft inspection in drydock. (5)

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Q7. With reference to tanks containing hydrocarbon liquids and vapours:

(a) define EACH of the following terms:

(i) explosive limits; (2)

(ii) vapour pressure; (2)

(iii) flash point. (2)

(b) explain how the atmosphere in cargo tanks containing varying percentages of flammable gas can be maintained in a safe condition at all times. (4)

2014/Dec						
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Q8. With reference to auxiliary boilers:

(a) state the effects of a persistently leaking safety valve on EACH of the following:

(i) the feed system; (1)

(ii) the valve itself. (3)

(b) explain the actions necessary to correct a leaking safety valve whilst at sea. (6)

2014/DEC						
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## SECTION – B

Q9. Describe, with the aid of a block diagram, how automatic starting, load sharing and stopping of generators in response to load changes is effected. (10)

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Q10. Describe how the starting torque of electric induction motors may be improved by using EACH of the following:

(a) wound rotor; (5)

(b) double cage. (5)

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Q11. (a) Describe, with the aid of a sketch, a synchro scope. (8)

(b) State TWO methods of paralleling generators if the synchro scope is inoperative. (2)

2014/Dec					
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## SECTION -C

Q12. As Chief Engineer Officer of an older vessel which has recently been purchased, write a report to the Superintendent Engineer detailing the items that should be inspected to ensure that the conditions of assignment are satisfactorily complied with. (10)

2014/Dec	2017/Dec	2019/Dec	2019/March			
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Q13. (a) State the system of classification for access doors passing through watertight bulkheads of a vessel. (3)

(b) State THREE circumstances under which all watertight doors must be closed when situations are defined as potentially hazardous. (3)

(c) Explain the safety features built into the watertight door operating system to enhance safety to personnel. (3)

2014/Dec	2015/Mar	2017/jul				
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Q14. As Chief Engineer Officer, outline the essential information to be supplied to the drydock management prior to drydocking a vessel. (10)

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