



# 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 2013

Attempt TEN questions only as follows: SIX questions from SECTION - A

TWO questions from SECTION - B TWO questions from SECTION - C

Marks for each part question are shown in brackets Section

### Section A

Q1. With reference to centrifugal pumps:

- (a) Sketch the pump characteristic curves; (3)
- (b) define net positive suction head; (1)
- (c) discuss the difference between the required and available suction head; (3)
- (d) describe pump cavitation, explaining how it affects the pump. (3)

2013/March	2015/Oct				
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Q2. With reference to plate heat exchangers, explain how EACH of the following design aspects promote heat transfer:

- (a) material selection;(5)
- (b) flow pattern; (3)
- (c) extended surface area. (2)

2013/March	2017/Oct	2018/Mar			
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Q3. Describe, with the aid of a sketch, the principle of operation of a capacitance electrode level measuring transmitter. (10)

2013/March	2015/Dec	2017/Mar			
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Q4. (a) Describe the maintenance and preventive measures that should be taken to reduce the risk of flooding from a mild steel seawater system to a minimum. (5)

(b) Describe, with reasons, the in-depth inspection to ensure the integrity of the system. (5)

2013/March					
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Q5. With reference to radial lip seals for propulsion shafting:(a) describe, with the aid of a sketch, an outboard seal arrangement as fitted to an oil lubricated stern tube; (6)

(b) explain, with reasons, the possible actions that should be taken in the event of loss of oil from the header tank. (4)

2013/March					
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Q5. With reference to radial lip seals for propulsion shafting:(a) describe, with the aid of a sketch, an outboard seal arrangement as fitted to an oil lubricated stern tube; (6)

(b) explain, with reasons, the possible actions that should be taken in the event of loss of oil from the header tank. (4)

2013/March					
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Q5. 6. With reference to ships' air conditioning systems:(a) state the effects of EACH of the following faults:

(i) corroded return air trunkings; (2)

(ii) blocked evaporator drains; (2)

(iii) defective capacity control. (2)



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(b) state the main health hazard that may arise in the air conditioning plant, stating the conditions that need to arise and the measures that should be taken to prevent this occurring. (4)

2013/March	2017/Mar				
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Q7. With reference to steam boilers:(a) list SIX alarms/trips that are fitted on a boiler, describing how EACH would be tested; (6)

(b) describe how the safety valves would be set under working conditions. (4)

2013/March					
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Q8. Write a procedure for preparing to go UMS. (10)

2013/March					
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## Section B

Q9. With reference to the protection of electrical equipment in a distribution system:

(a) state the aims of the protective devices; (3)

(b) list the parameters that are monitored and acted upon by the protective devices; (4)

(c) state, with reasons, THREE causes of electrical fires. (3)

2013/March	2017/Mar	2019/Mar			
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Q10. With reference to voltage variation profiles caused by load changes imposed on alternating current generators when starting large motors online:

(a) sketch a voltage dip, showing an acceptable recovery time; (2)

(b) state FOUR salient factors that cause the variation in part (a); (4)



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(c) outline FOUR salient factors that assist recovery from the deviation shown in part (a). (4)

2013/March	2017/Mar	2019/Mar			
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11. With reference to main circuit breakers on a switchboard:

(a) sketch a main circuit breaker when in test position, explaining the function tests that.

(b) can be carried out; (5)

(c) list the routine maintenance for the main circuit breakers; (3)

(d) state why it is bad practice to open circuit breakers whilst under load and under what.

(e) conditions it would be carried out. (2)

2013/March	2015/Oct			
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## Section C

Q12. (a) State THREE reasons for fitting transverse watertight bulkheads in ship construction. (3)

(b) Explain what constitutes a watertight bulkhead. (2)

(c) State the minimum number of transverse watertight bulkheads and their location. (2)

(d) Describe how watertight bulkheads are tested. (3)

2013/March	2015/Oct			
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Q13. With reference to large bulk carriers:

(a) sketch a cross section of a bulk carrier through the mid-ship; (5)

(b) explain the design features that have evolved to minimise the possibility of failure. (5)

2013/March	2019/July				
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Q14. 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)

2013/March	2014/Oct	2016/Oct			
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## July 2013

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TWO questions from SECTION - B TWO questions from SECTION - C

Marks for each part question are shown in brackets Section

### Section A

Q1. With reference to the design, construction and materials used in the manufacture of plate type heat exchangers, explain why, in most cases, they are superior to tubular type heat exchangers. (10)

2013/July	2019/July				
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Q2. With reference to fuel oil viscosity:

(a) explain why correct fuel oil viscosity is necessary;(2)

(b) describe TWO methods for the measurement of viscosity that are suitable for the inclusion into a

pneumatic or electronic control system; (6)

(c) state, with reasons, a control action for a viscosity controller. (2)

2013/July					
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Q3. With reference to automatic sprinkler systems for fire fighting purposes:

(a) explain, with the aid of a Heat Release versus Time diagram, the difference between fire control and fire suppression; (6)



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(b) state the limitations of using glass bulbs to activate sprinkler heads and suggest, with reasons, an alternative mechanism. (4)

2013/July	2017/Mar	2018/Mar			
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Q4. With reference to tunnel type bow thrusters:

(a) explain why some vessels are fitted with more than one bow thruster;(2)

(b) discuss the options available in terms of prime mover and transmission systems. (8)

2013/July					
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Q5. (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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Q6. Describe, with the aid of a block diagram, a compensated control system for an active fin stabilization unit. (10)

2013/July	2017/July				
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Q7. With reference to deck machinery:

(a) sketch a line diagram showing the layout and components of a hydraulic system with a variable delivery, pressure compensated pump and accumulator, suitable for the operation of deck machinery; (5)

(b) explain the advantages of using electrically driven machinery over hydraulically driven winches and windlasses. (5)

2017/Oct	2018/Dec				
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Q8. 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
- (e) treatment in the system. (1)

2013/July	2014/Mar	2015/July	2016/Dec	2017/Oct	
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## Section B

Q9. With reference to insulated and earthed electrical systems operating at High Voltage:

- (a) state the regulations pertaining to tankers; (4)
- (b) describe an instrument to detect earth leakage in EACH of the following systems:
  - (i) earthed; (3)
  - (ii) insulated. (3)

2013/July					
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Q10. Explain the meaning of EACH of the following types of electrical equipment:

- (i) intrinsically safe; (2)
- (ii) flameproof; (2)
- (iii) increased safety; (2)





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(iv) pressurised enclosure. (2)

(b) State TWO types of lighting equipment that may be installed in the pump room areas of a crude petroleum carrier. (2)

2013/July	2016/July	2017/Dec			
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11. With reference to voltage variation profiles caused by load changes imposed on alternating current generators when starting large motors online:

(a) sketch a voltage dip, showing an acceptable recovery time; (2)

(b) state FOUR salient factors that cause the variation in part (a); (4)

(c) outline FOUR salient factors that assist recovery from the deviation shown in part (a). (4)

2013/March	2013/July	2013/Oct	2016/Dec	2019/July	
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## Section C

Q12. Sketch FIVE methods used to prevent the distortion of ships' plates and frames during major welded hull repairs in dry dock. (10)

2013/July					
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Q13. With reference to twin skeg rudders:

(a) explain why a single rudder may not be suitable for some vessels; (3)

(b) state the advantages of a twin skeg installation in modern vessels with a large cargo carrying

capacity. (7)

2013/July					
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Q14. As Chief Engineer Officer on a new vessel which is experiencing severe aft end vibration at full-service speed, write a report to the Engineer Superintendent suggesting reasons for the vibration and recommendations for further sister vessels presently under construction. (10)

2013/July	2016/Dec				
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## October 2013

Attempt TEN questions only as follows: SIX questions from SECTION - A

TWO questions from SECTION - B TWO questions from SECTION - C

Marks for each part question are shown in brackets Section

### Section A

Q1. 1. With reference to static oily water separators, explain EACH of the following:

(a) why the supply pump should be carefully selected and matched to the separator; (2)

(b) how the separator achieves effective separation; (4)

(c) how the physical properties of each of the fluids to be separated affects the rate and effectiveness of separation. (4)

2013/Oct					
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Q2. 2. With reference to pneumatically operated control valves:

(a) sketch a valve with a double ported trim; (6)

(b) state ONE advantage and ONE disadvantage of a double ported valve; (2)

(c) explain the difference between fail safe and fail set. (2)

2013/Oct					
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Q3. With reference to pump selection, state TWO types of pump for EACH of the following applications, stating why they are suitable:

(a) bilge pumping; (2)



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(b) cargo oil stripping; (2)

(c) sewage sludge; (2)

(d) lubricating oil circulating; (2)

(e) sea water circulating. (2)

2013/Oct					
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Q4. 4. Describe a procedure for a function test of the operation of a machinery space CO2 smothering system. (10)

2013/Oct					
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Q5. (a) State the regulations pertaining to the main and auxiliary steering gear with reference to

EACH of the following:

(i) rudder angle and time of operation; (2)

(ii) electrical supply. (3)

(b) With reference to a hydraulic steering gear, explain EACH of the following:

(i) the factors that may contribute to the failure of a hydraulic pipe coupling; (2)

(ii) what is meant by the single failure concept. (3)

2013/Oct	2017/Dec	2018/Oct	2018/Mar		
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Q6. With reference to machinery parts under cyclic loading, describe, with the aid of sketches, how the propagation of even the smallest of cracks can lead to total component failure. (10)

2013/Oct	2016/July	2018/Mar			
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Q7.a) Sketch a Bioreactor type sewage treatment plant. (6)

(b) State the regulations regarding the allowable condition of the effluent discharged from this plant

sketched in part (a). (4)

2013/Oct					
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Q8. 8. In deck machinery hydraulic systems, state the functions of the hydraulic oil reservoir, explaining how these functions determine the construction and dimensions of the oil reservoir, making reference to the volume of the hydraulic fluid in the system. (10)

2013/Oct					
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## Section B

Q9. Describe, with the aid of a diagram, a shaft generator that uses a frequency converter. (10)

2013/Oct					
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Q10. With reference to a THREE phase electrical distribution system:

(a) discuss the advantages and disadvantages of an insulated neutral system; (8)

(b) state how an earthed neutral system is earthed and the measures taken to limit the maximum earth fault current. (2)

2013/Oct	2016/Mar	2017/July			
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11. With reference to voltage variation profiles caused by load changes imposed on alternating current generators when starting large motors online:

(a) sketch a voltage dip, showing an acceptable recovery time; (2)

(b) state FOUR salient factors that cause the variation in part (a); (4)



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(c) outline FOUR salient factors that assist recovery from the deviation shown in part (a). (4)

2013/March	2013/July	2013/Oct	2016/Dec	2019/July	
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## Section C

Q12. 12. With reference to structural fire protection in passenger ship accommodation spaces:

(a) define the meaning of Class A bulkheads, stating the requirements; (3)

(b) discuss the design of ventilation systems to prevent the spread of smoke and fire; (5)

(c) explain how the integrity of the bulkhead is retained with respect to ventilation trunkings, where A Class bulkhead have to be penetrated. (2)

2013/Oct	2017/Dec				
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Q13. With reference to drydocking a vessel:

(a) state the pre-docking information that should be given to the drydock authority; (5)

(b) list the items to be inspected once the dock is empty. (5)

2013/Oct	2018/Dec				
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Q14. With reference to double hulled oil tankers:

(a) sketch a mid ship cross section; (5)

(b) state the reason this type of design; (1)

(c) state FOUR disadvantages of this type of design. (4)

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## December 2013

Attempt TEN questions only as follows: SIX questions from SECTION - A

TWO questions from SECTION - B TWO questions from SECTION - C

Marks for each part question are shown in brackets Section

### Section A

Q1. (a) Explain EACH of the following control terms:

(i) cascade; (2)

(ii) split range. (2)

(b) Describe, with the aid of a sketch, a control system that may be enhanced by the inclusion of

cascade control. (6)

2013/Dec	2016/Mar	2018/Mar			
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Q2.State the inspections and maintenance that should be carried out on main sea water pipelines, strainers and ships side valves to minimise the risks of engine room flooding. (10)

2013/Dec					
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Q3. 3.(a) Describe TWO methods of priming centrifugal pumps. (6)

(b) List the advantages of EACH of the priming methods described in part (a).

(4)

2013/Dec					
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Q4. Sketch a hydraulic circuit for a four ram steering gear that allows FIVE different ram combinations to be used, stating how EACH ram and valve combination is achieved. (10)

2013/Dec					
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Q5. 5. With reference to machinery condition monitoring systems:

- (a) state what is meant by machinery condition monitoring; (2)
- (b) state the means available for gathering data; (3)
- (c) describe how the data is used to indicate machinery condition trends; (3)
- (d) explain the relevance of machinery condition monitoring to approved planned maintenance systems. (2)

2013/Dec					
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Q6. 6. A shipping company is investigating the possibility of converting a vessel from a traditionally manned engine room to Unattended Machinery Space (UMS) operations.

As Chief 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. (10)

2013/Dec					
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Q7. With reference to the lubrication of refrigeration compressors:

- (a) state the advantage of using fully synthetic oils; (2)
- (b) explain why oil may be carried over from the compressor; (3)
- (c) describe a device which returns oil from the compressor discharge to the compressor sump; (3)





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(d) state TWO reasons why an accumulation of oil in the evaporator is undesirable. (2)

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Q8. (a) Sketch a cargo space inert gas system that uses washed and cooled flue gas from a boiler. (5)

(b) List FIVE safety features built into the inert gas system, stating the function of EACH. (5)

2013/Dec					
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## Section B

Q9. 9. Describe, with the aid of a circuit diagram, the operation of an automatic voltage regulator (AVR) which employs the use of thyristors. (10)

2013/Dec	2018/Mar				
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Q10. 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)

2013/Dec	2014/Oct	2017/Oct			
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11. (a) With reference to an alkaline battery cell:

(i) describe a typical cell, stating the materials used; (4)

(ii) describe the electro-chemical process that takes place during discharge and charge. (2)



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(iii) state the effect of overcharge. (2)

(b) State the advantages of an alkaline cell compared with a lead acid cell. (2)

2013/Dec	2018/Dec				
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## Section C

Q12. Explain, with the aid of a mid-ship half sectional sketch of a container ship, how strength is built into this type of vessel whilst still allowing access to the cargo holds. (10)

2013/Dec	2016/Dec	2018/Mar			
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Q13. (a) Describe, with the aid of a sketch, how a hydraulically operated folding hatch cover opens and closes. (7)

(b) Explain how the water tightness and security of the hatch cover sketched in part (a) can be ascertained before proceeding to sea. (3)

2013/Dec					
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Q14. 14.(a) Explain why fatigue cracks occur in a ship's hull, stating the locations where they may be found. (3)

(b) Describe the hull inspection that should be carried out in drydock to ascertain the maintenance and repairs that may need to be carried out. (7)

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