



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 2015

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)

2015/Mar						
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Q2. With reference to centrifugal pumps:

- (a) state the operating principle of a centrifugal pump and why it is unnecessary to fit a relief valve to it; (2)
- (b) state TWO impeller types, explaining which type of application EACH would be best suited for; (4)
- (c) explain why cavitation occurs, and how it is reduced by design (4)

2015/March	2016/Mar	2017/Dec	2018/OCT		
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Q3. (a) List the laboratory tests that may be carried out on specimens of steel for ships' plate, stating reasons for these tests. (6)

(b) Outline FOUR features of a fracture in a component which would assist in the verification that brittle fracture had occurred. (4)

2015/Mar						
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Q4. (a) With reference to shipboard sewage treatment plants, describe the principle of operation of EACH of the following:

(i) Biological (3)

(ii) Physical (3)

(b) Explain why sewage systems involving aerobic action are to be preferred to those with anaerobic action. (2)

(c) Explain the meaning and significance of biological oxygen demand. (2)

2015/March						
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Q5. With reference to fin stabilisers:

(a) sketch a block diagram showing an automatic control system; (4)

(b) describe the operation of the system sketched in part (a); (4)

(c) explain how the stabilising fin forces are generated. (2)

2015/Mar						
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Q6. With reference to lubricating oil:

(a) state SIX tests that may be carried out on used lubricating oil; (6)

(b) outline FOUR possible causes of deterioration of the oil that may be indicated in the tests carried out in part (a). (4)

2015/MAR						
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Q7. 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)

2015/March							
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Q8. The company, with which you are employed, requests that all Chief Engineer Officers prepare standing orders regarding the prevention and detection of fires in the machinery spaces. Compile such a list of recommendations to be submitted to central office. (10)

2015/MAR	2016/MAR	2016/DEC	2017/July					
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SECTION - B

Attempt TWO questions only from this section

Q9. With reference to electrical short-circuits:

(a) state, with reasons, THREE factors that will influence the severity of a short circuit; (6)

(b) explain the role of reactance when selecting protective devices. (4)

2015/March	2016/March	2016/OCT	2019/OCT					
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Q10. With reference to alternating current generators:

(a) explain the meaning of the term synchronous impedance; (4)

(b) explain, with the aid of phasor diagrams, the effect of altering the excitation of one of a pair of machines that is operating in parallel. (6)

2015/Mar							
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Q11. 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)

2015/March	2018/July	2018/March							
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SECTION - C

Attempt TWO questions only from this section

Q.12. Explain why conventional liquid carriers are divided by longitudinal bulkheads. (2)

(b) Explain why ore carriers may be fitted with wing tanks. (2)

(c) State, other than the carriage of liquids, the purposes of double bottom tanks in dry cargo ships.(2)

(d) A dry cargo ship which has just completed loading is observed to be listing to starboard significantly.

The only available means of correcting the list is by adjusting the contents of two large adjacent double bottom ballast tanks port and starboard. The port tank is empty whilst the starboard is half full.

Describe, with reasons, the action a Chief Engineer Officer would advise. (4)

2016/March						
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Q.13. (a) Explain the Harmonised System of Survey & Certification (HSSC). (4)

(b) With reference to the load line certificate explain what will be inspected and how these items are kept in compliance. (6)

2015/Mar						
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Q.14. (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/March	2017/July				
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July 2015

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. (a) Describe, with the aid of a Strain versus Time diagram, how a creep test is carried out to determine the strain rate of the material under test. (6)

(b) Explain EACH of the stages sketched in the diagram in part (a). (4)

2015/July							
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Q2. Accidents have occurred due to premature or accidental release of CO₂ into the machinery spaces.

(a) State the safety procedure that the Chief Engineer Officer should adopt with respect to maintenance being carried out on the system by contractors. (3)

(b) State the procedure prior to the safe release of CO₂ into the machinery space in the event of fire. (4)

(c) Describe the factors that should be considered prior to re-entry of the machinery spaces after the release of CO₂ gas. (3)

2015/July							
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Q3. 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)



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

2013/July	2014/Mar	2015/July	2016/Dec	2017/Oct			
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Q4. Describe, with the aid of a sketch, the operation of a static Oily Water Separator which conforms to current MARPOL regulations and utilises a pump on the discharge side of the separator. (10)

2015/July	2016/July	2017/ DEC				
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Q5. (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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Q6. With reference to a ram type steering gear, explain how it may be determined that defective steering may be due to EACH of the following, stating the actions that should be taken to maintain steering capability:

- (a) a twisted rudder stock; (5)
- (b) worn pump internals; (3)
- (c) air in the system. (2)

2015/July					
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Q7. (a) Sketch a block diagram of a fully automated air conditioning system for accommodation spaces, annotating the relevant temperatures and relative humidities throughout the system. (7)

(b) Describe how bacteria are prevented from multiplying to a harmful level in an air conditioning system. (3)

2015/JULY						
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Q8. As Chief Engineer Officer, write a report to the Superintendent Engineer listing recommendations for the safety precautions to be adopted when servicing accommodation lifts. (10)

2015/July									
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SECTION – B

Q9. State the main electrical items covered in a Classification Society periodical survey. (10)

2015/July	2017/Oct						
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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)

2015/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/Mar	2015/July	2017/July				
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SECTION – C

Q12. (a) State the advantages and disadvantages of aluminium alloy in ship building (4)

(b) Describe, with the aid of a sketch, a method of welding aluminium panels. (6)

2015/July						
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Q13. (a) Explain why twin skeg rudders may be fitted on some vessels. (3)

(b) Explain the advantages of a twin skeg installation in modern vessels with a large cargo carrying capacity. (7)

2013/July	2015/July	2017/July				
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Q14. With reference to a bulk carrier, describe, as Chief Engineer Officer, the inspection that should be carried out on the upper topside areas. (10)

2015/July						
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October 2015

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. List the laboratory tests that may be carried out on specimens of steel for ships' plate, stating reasons for these tests. (6)

(b) Outline FOUR features of a fracture in a component which would assist in the verification that brittle fracture had occurred. (4)

2015/Mar	2015/Oct						
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Q 2. 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)

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

2013/Dec	2015/Oct						
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Q3. With reference to fin stabilisers:

(a) sketch a block diagram showing an automatic control system; (4)

(b) describe the operation of the system sketched in part (a); (4)

(c) explain how the stabilising fin forces are generated. (2)

2015/Mar	2015/Oct						
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Q4. 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/Mar	2015/Oct					
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Q5. With reference to pneumatically operated control valves:

- (a) state the reason for fitting valve positioners; (4)
- (b) with the aid of a sketch, explain valve hysteresis and how it affects the process; (4)
- (c) describe how the design and routine maintenance can limit hysteresis. (2)

2015/Oct	2017/Oct					
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Q6. With reference to fresh water HI-FOG fire fighting systems:

- (a) sketch such a system; (6)
- (b) state how the system in (a) is activated; (2)
- (c) state, with a reason, a suitable location for the above system. (2)

2015/Oct	2017/Oct					
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Q7. As Chief Engineer Officer write a set of standing orders that comply with the company's SMS system. State who should be reading and signing them. (10)

2015/Oct						
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- Q8. (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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SECTION – B

Q9. 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 KVEquipment;

(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	2014/Oct	2015/Oct				
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Q10. With reference to main circuit breakers on a switchboard:

(a) sketch a main circuit breaker when in test position, explaining the function tests that can be carried out; (5)

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

(c) state why it is bad practice to open circuit breakers whilst under load and under what conditions it would be carried out. (2)

2013/Mar	2015/Oct				
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Q11. (a) Describe, with the aid of a sketch, a static excitation system for a generator. (8)

(b) Explain TWO advantages of static excitation. (2)

2015/Oct	2015/Dec	2019/Mar				
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SECTION –C

Q12. (a) With reference to the overhaul of a ship side valve in dry dock explain, as Chief Engineer Officer,

what information should be given to the docking company prior to work commencing. (5)

(b) Describe how the valves would be overhauled stating the precautions to be taken before returning the ship to service. (5)

2015/Oct	2018/Mar						
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Q13. With reference to large fixed bladed propellers:

(a) describe, with the aid of a sketch, EACH of the following:

(i) the effect of hull fouling; (3)

(ii) operation in clean hull, ballast condition. (3)

(b) explain why fitting a light propeller may be beneficial. (4)

2015/OCT	2019/July						
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Q14. With reference to defects found in the steelwork of ballast tanks:

(a) explain the factors that may cause defects in ballast tanks; (4)

(b) state, with reasons, areas most likely to be affected and how they may be indicated; (4)

(c) state methods employed to minimise damage, caused by the factors in (a). (2)

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December 2015

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. Describe, with the aid of a sketch, the principle of operation of a capacitance electrode level measuring transmitter. (10)

2013/Mar	2015/Dec	2017/Mar				
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Q2. With reference to main thrust block arrangements:

- (a) explain how the tilting pads assist in the formation of an oil wedge; (2)
- (b) describe the actions that may be taken if upon inspection the pads are found to be:
 - (i) lightly scored; (2)
 - (ii) wiped; (2)
- (c) explain how the thrust clearance may be measured, stating a typical value;(2)
- (d) state the possible effects if the thrust clearance is incorrect. (2)

2015/Dec						
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Q3. 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	2015/Dec	2017/Mar				
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Q4. Describe the principle of operation of EACH of the following heat exchanger types, stating a suitable application for EACH type:

(a) parallel flow; (3)

(b) contra flow; (3)

(c) mixed flow. (4)

2015/Dec	2018/Oct						
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Q5. (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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Q6. (a) Sketch a block diagram of a fully automated air conditioning system for accommodation spaces, annotating the relevant temperatures and relative humidities throughout the system. (7)

(b) Describe how bacteria are prevented from multiplying to a harmful level in an air conditioning system. (3)

2015/July	2015/Dec						
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Q7. As Chief Engineer Officer, prepare standing orders for working with gas cutting and gas welding equipment, including the storage of spare bottles. (10)

2015/Dec	2018/Oct						
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Q8. As Chief Engineer Officer appointed to a newly acquired vessel, write a report to the Superintendent Engineer describing the inspection that should be carried out to ensure satisfactory condition and operation of the ship's fire fighting equipment. (10)

2015/DEC						
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SECTION – B

Q9. (a) Describe, with the aid of a sketch, a static excitation system for a generator. (8)

(b) Explain TWO advantages of static excitation. (2)

2015/Oct	2015/Dec	2019/July				
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SEP

Q10. With reference to the paralleling of a.c. generators:

(a) outline the requirements of synchronisation; (2)

(b) explain how KW power is shared; (1)

(c) explain how K var power is shared; (1)

(d) state SIX types of damage that may be caused when machines are incorrectly synchronized. (6)

2015/DEC	2018/Dec					
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Q11. (a) Explain the principle of operation of an insulation resistance test, stating why the test is carried out on a regular basis. (6)

(b) Describe how EACH of the following electrical tests is carried out:

(i) resistance; (2)

(ii) continuity. (2)

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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/March				
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Q13. During sea trials, extensive noise measurements are taken in accordance with the Code of Practice for Noise Levels in Ships.

(a) State and explain the unit of sound measurement. (2)

(b) State the noise level above which personnel are required to wear ear protection. (1)

(c) Explain how a ship's crew may be made aware of the hazards posed by exposure to excessive noise. (2)

(d) Explain how the noise levels can be reduced in the design of EACH of the following:

(i) diesel generators; (3)

(ii) ventilation fans and trunkings. (2)

2015/Dec	2016/Mar	2018/Dec					
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Q14. Explain the methods adopted in modern shipbuilding practice to prevent hull fractures due to corrosion fatigue, making reference to the sequence of assembly of the plating and welding and the subsequent protection on completion of construction. (10)

2015/Dec							
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