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 2017

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. (a) Explain why an engine may fail to start on air when the start air receiver is fully charged and the air receiver outlet to the engine is open. (10)

(b) Describe how problems with air starting systems may be avoided. (6)

2013/Oct	2017/March					

Q2. With reference to the use of camshaft chain drive systems on diesel engines:

(a) describe the inspection process and the possible defects that may be found; (8)

(b) describe how correct chain tension is maintained, stating the effects of incorrect tension. (8)

2012/Oct	2017/March					

Q3. With reference to a load sensing governor for an alternator driven by an auxiliary diesel engine:

(a) Describe, with the aid of a sketch, such a governor; (8)

(b) Describe the action of a governor in response to a large increase in electrical load; (4)

(c) Explain EACH of the following:

(i) The necessity for droop; (2)

(ii) How droop is effected. (2)

2017/March						

Q4. (a) Explain why crankshaft deflections are taken. (4)

(b) Write a procedure for the taking of main engine crankshaft deflections. (8)

(c) Explain the action to be taken if some crankshaft deflection readings are outside acceptable limits. (4)

2017/March	2017/dec					

Q5. (a) Sketch a diesel engine high pressure common rail fuel system, labelling the MAIN parts. (8)

(b) Describe how the common rail system sketched in part (a) operates, explaining how fuel injection timing is controlled.

2017/March						

Q6. As Chief Engineer Officer, write instructions for the actions to be taken in the event of a high temperature scavenge alarm being activated, due to a rapid rise in temperature, during a period of UMS operation, stating the reasons for EACH action. (16)

2017/March						

Q7. (a) Write the Chief Engineer Officer's Standing Instructions for the actions to be taken by the watchkeeping engineer in the event of failure of the engine room monitoring and alarm system. (8)

(b) State the procedure to be followed in the event of repeated activation of an oil mist detector alarm. (8)

2017/March						

Q8. With reference to poor ignition quality fuel:

(a) Explain how it can affect combustion in BOTH slow speed and medium speed diesel engines; (8) (b)

(b) Explain how the effects on BOTH diesel engine types in part (a) can be reduced. (8)

2017/March	2018/Dec					

Q9. A slow speed diesel engine crankcase lubricating oil analysis report indicates a substantial presence of fresh water, metal particles and a reduction of BOTH alkalinity and antioxidant reserve. Explain the possible causes of EACH of these changes, and how they may be found. (16)

2017/March						

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July 2017

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. As Chief Engineer Officer, write a report to the engineering superintendent regarding failure of a four-stroke main engine to complete a slow turning procedure and the discovery of water around a cylinder head gasket after the failed slow turning attempt. The report must outline possible causes of the problem and the steps taken to identify the exact cause. The report must also explain the measures taken to rectify the defect(s) and the steps taken to prevent similar future incidents. (16)

2014/Dec	2017/July	2018/Dec	2019/March			

Q2. With reference to main engine crankcase explosions:

a. Explain the cycle of events leading to a secondary crankcase explosion; (6)

b. As Chief Engineer, explain how an engine system should be managed in order to minimise the risk of a crankcase explosion and the effects of a crankcase explosion should one occur. (10)

2013/Dec	2015/Dec	2017/July	2018/Dec			

Q3. (a) Explain why a diesel engine cylinder is supplied with excess air. (4)

(b) Explain why fuel droplet size produced during injection has to be within narrow limits in order to enable good cylinder combustion to be achieved. (4)

(c) Explain how the desired fuel droplet size is produced by fuel injectors. (4)

(d) State why fuel injection timing has to be within narrow limits to enable economic engine operation without bearing overload. (4)

2014/Julu	2015/Dec	2017/ July				

Q4. With reference to a Closed Loop engine exhaust gas SOx scrubber system:

(a) Describe, with the aid of a sketch, such a system; (8)

(b) State, with reasons, the fluid which is used for SOx scrubbing in this system; (4)

(c) State how the effectiveness of the scrubbing fluid is maintained and how the sludge is removed and disposed of. (4)

2017/July	2019/March					

Q5. (a) Describe with the aid of sketches, the procedure for lifting a cylinder cover from a slow speed crosshead engine, explaining how the lifting gear is attached to the cover. (6)

(b) State the risks that may be associated with lifting a cylinder cover using the procedure described in part (a). (4)

(c) Describe the arrangements which must be in place to ensure that all lifting equipment has a current test certificate and is fit for operation. (6)

2010/July	2016/July	2016/July	2017/ July			

Q6. With reference to two stroke, slow speed engines:

Explain what is meant by the term thermal stress and how this can cause cracking of the crown surfaces; (4)

Sketch a cross section of a piston, labelling the MAIN components and indicating coolant flow; (8)

State a cause of EACH of the following defects:

(i) Burning of the crown upper surfaces; (2)

(ii) Carbon deposits in the cooling spaces. (2)

2015/March	2016/Dec	2017/July	2017/Oct			

Q7. (a) Describe, with the aid of a sketch, the arrangement of the gas and liquid fuel systems at the cylinder of a dual fuel 4-stroke engine, stating the input and output signals at the controller. (12)

(b) Describe the arrangement of the gas fuel piping system used for a 4-stroke dual fuel engine, stating the safety features incorporated. (4)

2017/July	2019/March					

Q8. Write a report to the engineering superintendent regarding the failure at sea of a crosshead main engine bottom end bearing. The report must explain how the defect was detected, the immediate action taken to prevent further engine damage, the subsequent action taken to ensure that the vessel was able to continue on passage to the next port, probable cause of the bearing failure and other checks made on the engine. (16)

2010/ Dec	2015/Oct	2017/July	2019/Oct			

Q9. With reference to medium speed diesel engine cylinder liners:

a. Explain the cause and effects of polishing and glazing; (6)

b. Explain the action of an anti-polishing ring during the operation of the engine; (5)

c. Describe how effective cylinder lubrication is achieved. (5)

2010/March	2010/Oct	2015/Oct	2017/July	2019/Oct		

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October 2017

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. With reference to diesel engine SOX exhaust gas cleaning and pollution control:

(a) State, with reasons, which system parameters are monitored, explaining where the monitoring devices are located, how the data is stored and how data is made available to regulatory authorities (10)

(b) State how pollution of sea water can be caused by the use of SOX exhaust gas cleaning systems, explaining how such pollution is prevented. (6)

2017/Oct						

Q2. (A)Explain action to be taken to ensure that the main engine may be operated in the event of an exhaust gas economiser developing a serious leak which cannot be immediately repaired (6).

(b) Describe how the heat transfer surfaces of economiser are maintained in a clean condition (4)

(c) Explain the action which should be taken in the event of a fire in the economiser. (6)

2010/ Dec	2014/Oct	2017/Oct				

Q3. As Chief Engineer Officer write a report to the engineering superintendent regarding the failure of a high-pressure fuel pump unit on an electronically controlled engine. The report must explain the nature of the failure, how the failure was detected, and the immediate action taken. The report must also explain the actions taken to replace the pump and the steps taken to minimise the risk of future similar fuel pump failures. (16)

2015/March	2016/July	2017/Oct				

Q4. A. Describe, with the aid of a sketch, a system for burning gaseous fuel in a two-stroke diesel engine, indicating safety features fitted and explaining why the gas has to be injected into the cylinder rather than mixed with the combustion air outside of the cylinders. (12)

B. Define the term Methane Slip, explaining how it occurs and why it is undesirable. (4)

2017/Oct	2017/Dec	2019/Oct				

Q5. (a) Explain how the buildup of residue in the scavenge space of a large slow speed two stroke engine is minimised by design, operation and maintenance. (10)

(b) Explain the possible damage which could be caused by a scavenge fire. (6)

2013/Oct	2017/Oct					

Q6. Write instructions for the actions to be taken by a duty engineer following activation of a slow speed main engine exhaust gas differential temperature alarm during a period of unmanned machinery operation. The instructions must cover the period from activation of the alarm to return of the main engine to normal operation. (16)

2012/Dec	2016/Dec	2017/Oct	2019/Oct			

Q7. (a) State, with reasons, THREE engine operating parameters which should initiate an automatic slowdown if engine operation is outside of set value conditions; (6)

(b) Describe how the operation of each slowdown listed in part (a) may be tested; (6)

(c) List two engine operating parameters which should initiate an automatic engine shutdown, in EACH case explaining why this parameter MUST shut down the engine (4)

2014/Dec	2014/Oct	2015/Dec	2017/Oct			

Q8. With reference to two stroke, slow speed engines:

Explain what is meant by the term thermal stress and how this can cause cracking of the crown surfaces; (4)

Sketch a cross section of a piston, labelling the MAIN components and indicating coolant flow; (8)

State a cause of EACH of the following defects:

(i) Burning of the crown upper surfaces; (2)

(ii) Carbon deposits in the cooling spaces. (2)

2015/March	2016/Dec	2017/July	2017/Oct	2019/July		

Q9. With reference to diesel engine starting air systems:

(a) write instructions for the checking of the starting air system in order to determine the reason for an engine failing to turn over when the starting air system is activated; (6)

(b) Describe the procedure for checking and preparing a starting air receiver for survey; (6)

(c) Explain why cooling is required between the compressor stages and after the final stage, stating the arrangement used for draining condensate from the coolers. (4)

2017/Oct	2017/Dec					

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December 2017

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. A. Describe, with the aid of a sketch, a system for burning gaseous fuel in a two-stroke diesel engine, indicating safety features fitted and explaining why the gas has to be injected into the cylinder rather than mixed with the combustion air outside of the cylinders. (12)

B. Define the term Methane Slip, explaining how it occurs and why it is undesirable. (4)

2017/Oct	2017/Dec	2019/Oct				

Q2. As Chief Engineer Officer, write a report to the engineering superintendent regarding the failure of a main engine cylinder liner due to cracking which resulted in water leakage from the cooling space into the cylinder. The report must explain how the defect was detected, the immediate action taken, the rectifying action taken to ensure that the engine could be operated, and the checks made on the engine before and after restarting.

2017/Dec						

Q3. With reference to failure of fuel injector nozzles due to burning:

(a) state, with reasons, THREE possible causes; (6)

(b) write a procedure to be used when investigating the cause of fuel injector nozzle burning; (6)

(c) describe a system which should be operated in order to minimise the risk of future fuel injector nozzle burning. (4)

2016/March	2017/Dec					

Q4. With reference to diesel engine starting air systems:

(a) Write instructions for the checking of the starting air system in order to determine the reason for an.engine failing to turn over when the starting air system is activated; (6)

(b) Describe the procedure for checking and preparing a starting air receiver for survey; (6)

(c) Explain why cooling is required between the compressor stages and after the final stage, Stating the arrangement used for draining condensate from the coolers. (4)

2017/Dec						

Q5. (a) Describe, with the aid of a sketch, a diesel engine air start system and the devices which are fitted to prevent or limit damage in the event of an explosion. (8)

(b) Explain how an explosion in a diesel engine air start system might occur. (4)

(c) As Chief Engineer Officer, outline the actions that should be taken to ensure that an explosion from the causes explained in part (b) may be avoided. (4)

2017/Dec						

Q6. With reference to crankcase lubricating oil:

(a) Describe the causes and effects of bacterial attack; (6)

(b) Explain how bacterial attack may be detected; (4)

(c) Describe how a crankcase lubricating oil system may be returned to service following bacterial attack. (6)

2011/Dec	2014/Dec	2017/Dec	2018/Oct			

Q7. With reference to slow speed diesel engine turbocharging:

(a) explain why water separators are fitted; (4)

(b) describe how an engine may be operated in the event of a charge air cooler being damaged beyond immediate repair; (6)

(c) describe how an engine may be operated in the event of a turbocharger bearing failure which cannot be repaired immediately. (6)

2014/March	2017/Dec					

Q8. (a) Write the Chief Engineer Officer's Standing Instructions for the actions to be taken by the watch keeping engineer in the event of failure of the engine room monitoring and alarm system. (8)

(b) State the procedure to be followed in the event of repeated activation of an oil mist fault alarm. (8)

2017/March	2017/Dec					

Q9. With reference to diesel engine SOX exhaust gas cleaning and pollution control:

(a) State, with reasons, which system parameters are monitored, explaining where the monitoring devices are located, how the data is stored and how data is made available to regulatory authorities (10)

(b) State how pollution of sea water can be caused by the use of SOX exhaust gas cleaning systems, explaining how such pollution is prevented. (6)

2017/Oct	2017/Dec					