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 2019

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)

2014/12-Q1	2017/07-Q7	2018/Dec-Q7	2019/Mar/Q1			

Q2. With reference to turbocharger systems;
a. Describe, with the aid of a sketch, a turbocharger jet assist system, explaining how it and why it is
used. (10)
b. Describe with the aid of a sketch a waste gate and by pass system explaining why such an arrangement
is fitted. (6)

2019/MAR/Q2						

Q3. 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/JUL/Q4	2019/Mar/Q3				

Q4. (A). Describe, with the aid of a sketch, the lubrication systems for a crosshead engine, explaining the

Properties required for the lubricating oil in each system; (10)

(B). Describe a system which may be used to ensure that the cylinder lubricating oil properties are available for a crosshead engine when changing between fuels (including between fuel oil and gas), stating why it is not desirable to use the same cylinder LO for high and low sulphur fuels (including gas); (6)

2019/Mar/Q4						

Q5. (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/Jul/Q7	2019/Mar/Q5					

Q6. a. Describe how crosshead bearing and guide clearances can be checked. (6)

b. Describe, with the aid of a sketch, the procedure for checking the condition of a crosshead engine bottom end bearing. (10)

2019/March/Q6	2019/Oct/Q7					

Q7. (A) Describe, with the aid of a sketch, an electronically controlled common rail fuel injection system for a marine diesel engine showing the pumps, common rail, control arrangements and injectors for one of the cylinders. (10)

(B) State, with reasons, the advantages of an electronically controlled common rail fuel injection system.

2019/Mar/7						

Q8. A. Describe, with the aid of a sketch, a main engine cooling water system, explaining why different parts of the system have different operating temperatures. (10)
B. Describe the charge air supply system for a turbocharged engine, explaining the purpose of each main part. (6)

2019/Mar/Q8					

Q9. (a) Explain why multiple air inlet and exhaust valves are fitted to some medium speed diesel engines. (4)
(b) Explain how the valve actuator (tappet) clearance is set for multiple valve installations. (4)

(c) Write a procedure for checking the valve operating mechanisms of a medium speed engine. (8)

2019/JUL/Q1	2020/JUL/Q9				

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

JULY 2019

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. With reference to turbocharger systems:

(a) Describe how performance of the system is monitored and how the information gathered is used to assess performance; (8)

(b)Describe the arrangements for maintaining the systems in good condition. (8)

2019/Jul/Q1						

Q2. (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 start systems may be avoided.

2013/10-Q1	2017/Mar-Q1	2019/Jul-Q2			

Q3. 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/Q3	2015/Oct/Q6	2017/Jul/Q8	2019/jul/Q3			

Q4. Describe a procedure for cylinder liner calibration, indicating how the readings are recorded to allow for easy recognition of liner wear. (10)
Describe TWO forms of abnormal cylinder liner wear, explaining how each is recognized.
Explain how abnormal cylinder liner wear may be prevented. (6)

2019/Jul/Q4						

Q5. With the aid of sketches, describe the operation of a dual fuel 4 stroke engine when operating on gas.

For the engine described in Q5 (a), explain how and when the fuels are supplied to the cylinders.

2019/Jul/Q5					

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/Mar/Q8	2016/Dec/Q8	2017/Jul/Q6	2017/Oct/Q8	2019/Jul/Q6	

Q7. (a) Describe, with the aid of a sketch, a main engine and generator engine fuel system which has the capability of changing the generators from HFO to MDO operation whilst maintaining circulation of HFO in the main engine system. (8)
(b) Write instructions for the change of the generator engines to operation on MDO whilst keeping the main engine fuel system circulated with HFO during stay in a port where fuel burning restrictions apply. (8)

2012/Jul-Q4	2019/Jul/Q7						

Q8. A. Describe, with the aid of a sketch, a Selective Catalytic Reduction system, explaining the chemical reaction for reducing NOx and the control system requirements. (10)
B. State two engine-based systems for reducing marine diesel engine NOx, explaining how they reduce NOx level but also increase fuel consumption and CO2 emissions. (6)

2019/Jul/Q8								

Q9. Explain the possible causes and actions to be taken in the event of a high exhaust temperature on a 4-stroke generator engine at:
(i) A single cylinder (3)
(ii) More than one cylinder (3)
Explain why multiple air inlet and exhaust valves are fitted to highly rated 4-stroke engines (4)
Describe an arrangement for operating multiple valves from a single cam, explaining how the tappet clearance is set for both valves. (6)

2019/Jul/Q9						

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

OCTOBER 2019

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. Describe, with the aid of an S/N curve, the relationship between applied stress and the number of applied stress fluctuations in fatigue crack propagation. (5)

Define the term Stress Raiser, giving examples and explaining the influence of a stress raiser on the propagation of a crack. (5)

Define the term Fatigue Limit, explaining, with examples, how poor maintenance and poor machine operation can result in fatigue crack propagation even though a component has been designed to avoid fatigue cracking (6)

2019/Oct/Q1						

Q2. As Chief Engineer write instructions for the main and auxiliary engine fuel change-over procedures to be followed when a vessel is due to move into an Emission Control Area. Approximate times must be mentioned to ensure that the vessel does not infringe any regulations and the instructions must mention steps required to avoid cross-contamination of fuel in service tanks, where MGO is carried as the low

2013/DEC/Q3	2019/Oct/Q1					

Q3. (a) Explain why multiple air inlet and exhaust valves are fitted to some medium speed diesel engines. (4)
(b) Explain how the valve actuator (tappet) clearance is set for multiple valve installations. (4)
(c) Write a procedure for checking the valve operating mechanisms of a medium speed engine. (8)

2019/MAR/Q8	2019/Oct/Q3						

Q4. Write a report for the engineering superintendent regarding the replacement of the fuel injectors of three main engine units due to severe erosion of the nozzle holes and burning of the injector tips. The report must explain how the defects were detected, the likely

cause of the damage and the action which has been instituted to prevent further incidents of this type. (16)

2013/Jul/Q3	2019/OCT/Q4				

Q5. 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/Mar/Q4	2010/Oct/Q4	2015/Oct/Q2	2017/Jul/Q9	2019/Oct/Q5	

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/Q2	2016/DEC/Q9	2017/Oct/Q6	2019/Oct/Q6		

Q7. A. Describe how crosshead bearing and guide clearances can be checked. (6)
b. Describe, with the aid of a sketch, the procedure for checking the condition of a crosshead engine bottom end bearing. (10)

2019/MAR/Q6	2019/Oct/Q7				

Q8. With reference to boilers and steam generation systems:
(a) Explain the term water hammer, stating how it is caused and describing the possible consequences of it; (4)
(b) explain how water hammer can be avoided; (4) (c) describe, with the aid of a sketch, how the boiler fuel system may be operated in port to comply with local emission control regulations. (8)

2018/DEC/6	2019/Oct/Q8				

Q9. 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/Q4	2017/Dec/Q1	2019/Oct/Q9				

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

DECEMBER 2019

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. (a) Describe, with the aid of a sketch, a main engine holding down system explaining how the design features help prevent excessive stress in the holding down studs. (8)
(b) Describe, with the aid of a sketch, an engine top bracing arrangement, explaining why they are fitted and checked for operational performance. (8)

2014/Dec	2019/Dec/Q1					

Q2. (a) Sketch a main engine fuel system from the HFO and Low Sulphur service tanks to the main engine, showing all important valves. (6)
(b) Using the sketch drawn in part (a), write instructions for the changeover of a main engine fuel system from HFO to Low Sulphur fuel, indicating the timescale for each operation. (10)

2013/Jul	2019/Dec/Q2					

Q3. (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/Jul/Q7	2019/Mar/Q5	2019/Dec/Q3				

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/Jul/Q4	2019/Mar/Q3	2019/Dec/Q4				

Q5. Write a report for the engineering superintendent regarding the replacement of the fuel injectors of three main engine units due to severe erosion of the nozzle holes and burning of the injector tips. The report must explain how the defects were detected, the likely cause of the damage and the action which has been instituted to prevent further incidents of this type. (16)

2013/Jul/Q3	2019/Oct/Q4					

Q6. (a) As Chief Engineer, explain how the performance of a main diesel engine may be determined, indicating how the information collected is analyzed to assess the performance of an individual cylinder in relation to the overall engine performance. (6)

(b) Explain how defective fuel injection may be detected stating, with reasons, the causes of defective cylinder fuel injection. (6)

(c) Explain the causes of afterburning in a single cylinder of a diesel engine, stating how this may be brought to the attention of the duty engineer. (4)

2019/Oct/Q6						

Q7. With reference to cylinder liner scuffing:

(a) explain how it is caused, stating the method of detection; (6)

(b) explain the effects of cylinder liner scuffing; (4)

(c) explain how minor scuffing may be treated in order to avoid the need for liner replacement. (6)

2013/Dec	2019/Dec/Q7					

Q8. (a) Write a procedure for the action a duty engineer should take on being called to the engine room during a UMS period in the event of an engine slowdown due to a high cylinder exhaust temperature on the main propulsion engine. (6)

(b) State, with reasons, the possible causes of a high exhaust temperature on a single cylinder of a main propulsion engine. (5)

(c) Explain why a defect resulting in a high exhaust temperature on one cylinder can cause engine damage if the engine is not slowed down when the fault initially occurs. (5)

2013/March	2014/Dec	2016/Jul	2016/dec	2018/March/Q3	2019/Dec/Q8	

Q9. (a) Describe, with the aid of a sketch, the lubrication systems of a crosshead type slow speed diesel engine. (8)

(b) Explain the properties required by the lubricating oil in each of the systems described in part (a),

stating how these properties compare with those of a lubricating oil used in the crankcase of a trunk piston type diesel engine. (8)

2013/Jul	2019/Dec/Q9					