UK MARINE TRAINING CENTRE (UMTC)
SAI POOJA BUILDING, SHOP NO. 4, PLOT NO. 36, SECTOR - 34. KAMOTHE, NAVI MUMBAI - 410 209 MAHARASHTRA, INDIA.
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MARCH 2013

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. (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 scavenge temperature alarm on the main propulsion engine. (6)

(b) State, with reasons, the possible causes of a high scavenge temperature on a main propulsion engine.

(4)

(c) Explain why a condition resulting in the activation of high scavenge temperature alarm can cause engine damage if the engine is not slowed down when the fault initially occurs. (6)

2013/March						

Q2. (a) State why Direct Water Injection is used on some diesel engines, explaining how it performs the intended duty. (8)

(b) Describe, with the aid of a sketch, a Direct Water Injection system. (8)

2013/March						

Q3. With reference to diesel engine crankshafts:

(a) explain the causes and effects of torsional vibration; (4)

(b) explain the term critical speed, stating why the engine should not be continuously operated at this speed; (6)

(c) explain the term fatigue cracking, stating, with reasons, TWO factors which have an influence on the likelihood of fatigue cracking. (6)

2013/March						

Q4. With reference to a slow speed diesel engine fitted with a single turbocharger, describe, with reasons, the possible action which could be taken to enable the main engine to be operated, if whilst on oceanic passage, a small portion of one of the impeller vanes breaks off and impacted with the charge air cooler. (16)

2013/March						

Q5. (a) Describe the procedure for checking and adjusting the timing of a main engine fuel injection pump. (8)

(b) Explain how diesel engine power balance is achieved, stating why it is essential. (8)

2013/March						

Q6. (a) Describe the symptoms and possible causes of an exhaust gas boiler/economiser fire. (5)

(b) Describe the procedure for inspecting and cleaning the gas side of an exhaust gas boiler/economiser. (5)

(c) Explain how the main engine and auxiliary steam plant may be operated in the event of an exhaust gas boiler/economiser suffering severe damage rendering it inoperable. (6)

2013/March						

Q7. With reference to a main engine air starting system:

(a) explain why a slow turning system is fitted; (4)
(b) state, with reasons, when a slow turning system operates; (2)
(c) describe, with the aid of a sketch, an air starting system, explaining how the slow turning system operates. (10)

2013/March						

Q8. (a) Describe, with the aid of a sketch, a main engine hydraulically operated exhaust valve which is designed to rotate in service. (8)

(b) Explain TWO methods how the opening of the exhaust valve described in part (a) can be controlled. (4)

(c) Explain why the valve described in part (a) is rotated. (4)

2013/March						

Q9. (a) Explain how a diesel generator is prepared and selected as a standby generator. (8)

(b) Write a procedure for checking a diesel generator engine after it has been shut down and before it is returned to standby duty. (8)

2013/March								

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July 2013

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. (a) With reference to safety, state, with reasons, THREE fluid pipeline systems which require particular attention prior to dismantling main machinery for overhaul. (9)

(b) Write instructions for the preparation of a main engine cylinder cover from finished with engines to being ready to lift from the engine. (7)

2013/July						

Q2. (a) Explain fatigue cracking, stating its causes and propagation. (8)

(b) Explain how the risk of fatigue cracking of cylinder head holding studs is liable to be increased by poor maintenance and engine overload. (8)

2013/July						

Q3. 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/July						

Q4. With reference to abnormal and excessive cylinder liner wear:

(a) explain how it may be caused, stating how it is detected; (6)

(b) explain the effects and consequences of excessive cylinder liner wear; (5)

(c) explain how abnormal cylinder liner wear maybe prevented. (5)

2013/July						

Q5. With reference to diesel engine exhaust emissions:

(a) explain the cause and effects of EACH of the following:

(i) Oxides of Nitrogen (NOx); (3)

(ii) Oxides of Sulphur (SOx); (3)

(b) describe ONE method by which the level of NOx emissions may be reduced; (5)

(c) explain how the effects on the engine components of sulphur in the fuel may be minimised. (5)

2013/July						

Q6. (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/July						

Q7. (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/July						

Q8. With reference to electronically controlled engines:

(a) describe how fuel injection quantity and timing is adjusted; (6)

(b) describe how the exhaust valve timing maybe varied; (5)

(c) describe how starting air valves are regulated. (5)

2013/July						

Q9. (a) Describe, with the aid of a sketch, a waste heat recovery system for electrical generation using main engine exhaust gas in combine gas/steam turbine systems. (8)

(b) Describe the operation of the waste heat recovery system described in part (a) whilst the associated main engine is running. (8)

2013/July						

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October 2013

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 or quickly resolved. (6)

2013/Oct						

Q2. With reference to operating medium speed diesel engines on residual fuel:

(a) state, with reasons, FOUR of the main problems; (4)

(b) describe how the problems stated in part (a) may be minimised in order to ensure that an engine may be operated correctly; (4)

(c) explain the dangers associated with fuel systems and how they are mitigated. (8)

2013/Oct						

Q3. (a) List TWO automatic main engine slowdown parameters, stating why EACH is applied to an engine. (4)

(b) List TWO automatic main engine shutdown parameters, stating why EACH is applied to an engine. (4)

(c) Explain how EACH of the parameters listed in part (a) and part (b) are tested for the correct operation. (8)

2013/Oct						

Q4. As Chief Engineer Officer outline a procedure for the changing of a cylinder liner in a large crosshead diesel engine from the removal of the cylinder cover to the replacement of the liner. (16)

2103/Oct						

Q5. (a) Explain how the build up 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						

Q6. With reference to four stroke diesel engine emission control:

(a) describe how the Miller Cycle operates to control NOx emissions; (6)

(b) describe, with reasons, the modifications needed for a medium speed engine to operate on the Miller Cycle; (8)

(c) give the advantages and disadvantages of closed against open scrubber systems. (2)

2013/Oct						

Q7. With reference to engine operation:

(a) state, with reasons, the symptoms which would indicate a cylinder head was cracked between the combustion chamber and the water space; (4)

(b) describe the actions that should be taken if the engine with the symptoms in part (a) cannot be

immediately stopped; (6)

(c) write a report to the Superintendent outlining the probable cause and actions to prevent further occurrence. (6)

2013/Oct						

Q8. With respect to marine fuels:

(a) explain why the use of fuel additives maybe considered; (6)

(b) explain the problems caused by different contaminants in the fuel; (6)

(c) explain the problems caused by fuels from different sources and how these are minimised. (4)

2013/Oct						

Q9. (a) State, with reasons, the properties required of a lubricating oil for a trunk piston type, medium speed engine, indicating why some properties differ from those required of a lubricating oil used in the crankcase of a crosshead diesel engine. (6)

(b) Describe, with the aid of a sketch, the lubrication system of a trunk piston medium speed engine, explaining how impurities in the lubricating oil are removed. (10)

2013/Oct						

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December 2013

Attempt SIX questions only

Marks for each part question are shown in brackets

Q1. Write a report for the engineering superintendent regarding the replacement at sea of a main engine cylinder cover. The report must explain how the problem was detected, the likely cause of the damage and the action which has been instituted to prevent further incidents of this type. (16)

2013/Dec							

Q2. (a) Explain the term scuffing in relation to cylinder liners, stating how it is caused. (5)

(b) Describe another form of abnormal cylinder liner wear which does not involve scuffing, explaining how this form of abnormal wear is caused. (5)

(c) Explain how incidents of abnormal cylinder liner wear may be kept to a minimum. (6)

2013/Dec						

Q3. 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 Sulphur fuel. (16)

2013/Dec						

Q4. (a) Explain the term torsional vibration, indicating the effect this can have on an engine crankshaft. (6)

(b) Explain why a detuner/vibration damper might be fitted to an engine. (5)

(c) Explain why an engine might have a barred speed range and why the engine should not be operated continuously in that range. (5)

2013/Dec							

Q5. (a) Describe, with the aid of a sketch, a main engine starting air system, stating the safety devices which are incorporated. (8)

(b) In the event of the main engine failing to turn over on air even thought here was sufficient air pressure in the starting air receivers, explain the procedure for tracing the cause of the failure. (8)

2013/Dec							

Q6. (a) Describe, with the aid of a sketch, an electronically controlled main engine fuel injection system. (8)

(b) Explain how the system described in part (a) functions to change the fuel injection timing when instructed by an engineer at the control terminal. (8)

2013/Dec						

Q7. 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						

Q8. (a) Discuss the dangers associated with a main engine starting air system, explaining how these dangers are mitigated. (9)

(b) State, with reasons, THREE causes of an engine failing to fire on fuel after successfully turning over on starting air. (3)

(c) Explain how the engine is transferred to local (engine side) control in the event of failure of the main engine remote control system. (4)

2013/Dec						

Q9. With reference to a waste heat boiler/economiser:

(a) write a procedure for the cleaning of the gas side of a waste heat boiler/economiser when the associated main engine is:

(i) running; (5)

(ii) stopped. (5)

(b) write a procedure for operation of the main engine when the associated waste heat boiler/economizer cannot be operated due to tube failure. (6)

2013/Dec							