

ENGINEERING KNOWLEDGE - MOTOR

Attempt SIX questions only

Marks for each part question are shown in brackets

1. Write a report for the engineering superintendent regarding the replacement at sea of bearings on one of the main engine turbochargers. The report must explain how the bearing defects were detected, the likely cause of the damage and the action which has been implemented to prevent further incidents of this type.

(16)

2. With reference to Power Management Systems:

(a) describe, with the aid of sketches, a starting air system;

(8)

(b) state the precautions and conditions which must be observed when an auxiliary engine is under control of the Power Management System;

(4)

(c) explain how an auxiliary engine is started when under the control of the Power Management System.

(4)

3. (a) Describe, with the aid of a sketch, either a diesel engine Open Loop SO_x scrubber system or a Closed Loop SO_x scrubber system.

(10)

(b) Explain what systems need to be monitored in order to ensure that the scrubber system meets all IMO regulations.

(6)

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

(a) explain the cause and effects of liner *polishing* or *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)

5. (a) Describe, with the aid of a sketch, the water/steam circulation system for the waste heat recovery system.

(5)

(b) Explain how economiser circulation pumps are maintained in a cool condition to allow for prolonged operation without problem.

(3)

(c) Describe how a waste heat recovery system steam pressure is maintained and the system operated when the associated diesel engine plant is operating on EACH of the following:

(4)

(i) low engine load;

(4)

(ii) low steam demand.

6. With reference to a main engine fuel system of the high pressure common rail type:

- (a) sketch a common rail fuel injection system from booster pump inlet to cylinder head fuel valves, labelling the MAIN components; (8)
- (b) explain how the fuel pumps are operated and the common rail pressure is maintained; (4)
- (c) explain how fuel injection timing and quantity is regulated for the common rail fuel system sketched in part (a). (4)

- 7.
- (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 different fuel specifications (including gas). (6)

8. While operating in heavy weather the main engine loses power and misfires. Investigation shows considerable quantities of water in the fuel.

- (a) As Chief Engineer Officer explain the immediate actions which should be taken to ensure safe operation of the ship. (6)
- (b) State, with reasons, the possible sources of water entering the fuel storage, handling and supply system. (5)
- (c) As Chief Engineer Officer write the standing orders that would be issued with respect to operation of the fuel storage, handling and supply system. (5)

9. With reference to oil fired boilers:

- (a) describe, with the aid of a sketch, the fuel system including the pilot ignition system; (6)
- (b) explain how the boiler whose fuel system is described in part (a) is flashed up from cold on diesel oil and changed over to heavy fuel operation; (6)
- (c) explain how the air and fuel supplies are controlled together in order to produce optimum combustion at all loads. (4)