MARINE DIESEL ENGINEERING

Attempt ALL questions
Marks for each part question are shown in brackets

1. With reference to diesel engines, explain EACH of the following terms:
   (a) top dead centre; (1)
   (b) bottom dead centre; (1)
   (c) piston stroke; (2)
   (d) swept volume; (2)
   (e) clearance volume; (2)
   (f) compression ratio. (2)

2. With reference to diesel engine turbocharging:
   (a) explain why the charge air from a turbocharger is cooled before entering the engine cylinder; (4)
   (b) explain the possible effects of excessively cooled charge air; (3)
   (c) explain the possible effects of inadequately cooled charge air. (3)

3. (a) State THREE desirable properties of piston rings. (3) Look at again
   (b) State the materials commonly used for piston rings. (2)
   (c) Sketch THREE different types of piston ring ends. (3)
   (d) Explain why piston ring end clearance is necessary. (2)

4. (a) Sketch a section through a crankcase relief valve, labelling the MAIN components. (5)
   (b) Explain the conditions which must be present for a crankcase explosion to occur. (5)

5. With reference to diesel engine fuel:

   (a) explain the meaning of the term *microbial contamination*; (1)

   (b) describe the possible problems the engine may encounter if the fuel received is contaminated with microbes; (4)

   (c) explain how *microbial contamination* can be avoided; (2)

   (d) explain the actions to be taken if *microbial contamination* is severe. (2)

6. Describe, with the aid of a sketch, the operation of a centrifugal type lubricating oil filter, labelling the MAIN components. (10)

7. (a) State FOUR conditions for the fresh water cooling system treatment program to be effective. (4)

   (b) State the function of the inhibitor used in fresh water cooling treatment. (3)

   (c) Explain the safety considerations needed when handling the inhibitors. (3)

8. (a) Describe, with the aid of a sketch, the construction of a plate type heat exchanger. (7)

   (b) State THREE advantages of the plate types, compared with the tube type heat exchanger. (3)

9. (a) Describe how to calibrate a diesel engine cylinder liner, already removed from the engine. (6)

   (b) State the precautions that should be taken during initial startup when putting a new liner into service. (4)

10. (a) Sketch a block diagram of a lubricating oil system suitable for use with a reduction gearing, including all the protective devices. (5)

    (b) State the engineering purpose/function of EACH item in the system sketched in part (a). (5)