ENGINEERING KNOWLEDGE - GENERAL

Attempt TEN questions only as follows:
SIX questions from section A
TWO questions from section B
TWO questions from section C
Marks for each part question are shown in brackets

Section A

1. (a) Materials used for hull and machinery are subject to stress and strain in service.

Define EACH of the following:

(i) THREE types of stress; (3)

(ii) TWO types of strain. (2)

(b) Describe the tests that may be carried out on steel to be used for ships side plating. (5)

2. With reference to control systems, explain EACH of the following:

(a) two-step action; (2)

(b) offset; (2)

(c) gain; (2)

(d) proportional action; (2)

(e) integral action. (2)

3. (a) Sketch a muff type propeller shaft coupling. (5)

(b) Describe how this type of coupling is connected. (5)

4. Describe EACH of the following heat exchanger types, stating a suitable application for EACH type:

(a) parallel flow; (3)

(b) contra flow; (3)

(c) mixed flow. (4)

5. (a) Describe, with the aid of a sketch, the operation of a biological sewage treatment plant. (10)

6. With reference to a vapour compression refrigeration plant, explain the purpose of EACH of the following:

(a) room thermostat; (2)

(b) expansion valve; (2)

(c) high pressure cut out; (2)

(d) safety head; (2)

(e) unloader. (2)

7. With reference to the treatment of domestic water for potable use:

(a) describe the principle of operation of a steriliser that uses silver ions; (4)

(b) state the advantages of silver ion sterilisation over other methods; (2)

(c) state the inspections and maintenance that should be carried out on EACH of the following:

(i) fresh water tanks; (2)

(ii) calorifiers. (2)

8. (a) With reference to bunkering fuel oil, list the information to be supplied to the port authorities prior to commencement of bunker operations. (5)

(b) With reference to the tank being filled, state the factors that govern the bunker loading rate. (4)

(c) State a possible effect of a high bunker loading rate. (1)

Section B

9. With reference to reverse power protection for a.c. generators operating in parallel:

(a) explain why traditional reverse power relays, operating on mechanical principles, have been replaced by electronic digital microprocessor types; (2)

(b) describe, with the aid of a sketch, a generator reverse power protection circuit that uses an electronic phase sensitive detector. (8)

10. (a) Describe, with the aid of a sketch, the constructional details of a squirrel cage rotor as fitted in an induction motor. (7)

(b) Explain why some rotors have a double cage. (3)

11. With reference to insulation testing of electrical equipment:

(a) state the reasons for insulation testing and why it is carried out on a regular basis; (2)

(b) describe the procedure for taking a set of insulation readings on an electric motor in-situ, stating the minimum acceptable readings; (6)

(c) explain the term *Polarisation Index*. (2)

Section C

12. With reference to the structure of a large passenger ship, describe the requirement for preventing the spread of fire and smoke. (10)

13. (a) Explain the cause and effects of panting and pounding at the forward end of a ship. (5)

(b) Sketch the constructional details designed to resist panting and pounding. (5)

14. Describe the items that should be inspected to ensure that the conditions of assignment of Load Line are satisfactorily complied with. (10)