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) Describe, with the aid of a Strain versus Time diagram, how a creep test is carried out to determine the strain rate of the material under test. (6)

   (b) Explain EACH of the stages sketched in the diagram in part (a). (4)

2. With reference to fuel oil viscosity:

   (a) explain why correct fuel oil viscosity is necessary; (2)

   (b) describe, with the aid of a sketch, a method for the measurement of viscosity suitable for the inclusion into a pneumatic or electronic control system; (6)

   (c) state, with reasons, a control action for a viscosity controller. (2)

3. (a) Define *propeller slip*, explaining how it is calculated. (2)

   (b) State, with reasons, FOUR conditions which will affect the *propeller slip*. (8)

4. With reference to the design, construction and materials used in the manufacture of plate type heat exchangers, explain why, in most cases, they are superior to tubular type heat exchangers. (10)

5. With reference to Marine Growth Prevention Systems, which incorporate impressed current anodes fitted in the sea boxes or sea strainers of main seawater cooling water systems:

   (a) explain how the system protects steel pipework against marine growth and corrosion; (6)

   (b) explain how the effectiveness of the system can be ascertained; (2)

   (c) state the advantages this system has over one which makes use of biocides. (2)

6. As Chief Engineer Officer appointed to a newly acquired older vessel, compile a list of all the checks that would be required of the ship's steering gear and associated equipment, given that no hand over from the previous owners had taken place. (10)

7. (a) Sketch a diagrammatic arrangement of a fully automatic provision refrigeration system incorporating a number of cold rooms. (5)

(b) Explain the sequence of events from a demand for refrigerating effect in a cold room until the room has reached its desired temperature. (5)

8. List TEN checks that a Chief Engineer Officer should make prior to a Port State Control inspection of the engine room and its equipment. (10)

Section B

9. With reference to the paralleling and load sharing of a.c. generators:

(a) state the requirements for synchronisation; (3)

(b) state how KW power is shared; (1)

(c) state how Kvar power is shared; (1)

(d) list the features that the Automatic Power Management System controls for the operation of main switchboards and generators when the engine room is in unattended mode. (5)

10. During a complete loss of electrical power, essential vital services can be maintained by means of an Uninterruptable Power Supply (UPS).

(a) Describe, with the aid of a block diagram, the operation of an a.c. input UPS arrangement. (7)

(b) List SIX essential services that the UPS or emergency batteries may support. (3)

11. (a) Explain the principle of operation of an insulation resistance test, stating why the test is carried out on a regular basis. (6)

(b) Describe how EACH of the following electrical tests is carried out:

(i) resistance; (2)

(ii) continuity. (2)

Section C

12. (a) Explain the causes and effects of panting and pounding, indicating the affected areas. (5)

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

13. With reference to double hulled oil tankers:

(a) sketch a mid ship cross section; (5)

(b) state the reason this type of design; (1)

(c) state FOUR disadvantages of this type of design. (4)

14. Describe an in-water survey to classification society requirements of the underwater structure of a large vessel. (10)