



Cibm

**MINISTRY OF PORTS AND SHIPPING
MERCHANT SHIPPING SECRETARIAT - SRI LANKA**

**EXAMINATION FOR CERTIFICATE OF COMPETENCY
CHIEF ENGINEER OFFICER (Unlimited)
ENGINEERING KNOWLEDGE – I (GENERAL)**



TIME ALLOWED - THREE HOURS

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

Pass mark **50%** of the total along with at least **10** marks for each B & C Sections.

Answers with clear sketches/diagrams, Neat handwriting and clear expression will get full marks.

SECTION-A

1. With reference to the metallurgy of plain carbon steel:
 - (a) sketch an iron carbon equilibrium diagram, labelling the salient points; **(6 Marks)**
 - (b) explain EACH of the following terms:
 - (i) austenite: **(2 Marks)**
 - (ii) cementite. **(2 Marks)**
2. With regard to the type approved Ballast Water Management Systems (BWMS)
 - a) List the BWMS technologies presently exists **(4 Marks)**
 - b) State the characteristics of technologies listed in the above part (a) when;
 - (i) De-infection when ballasting **(3 Marks)**
 - (ii) After treatment when de-ballasting **(3 Marks)**
3.
 - a) Sketch a line diagram showing the layout and components of a hydraulic system with a variable delivery, pressure compensated pump and accumulator, suitable for the operation of deck machinery. **(5 Marks)**
 - b) Describe the operation of the system sketched in the above part (a). **(5 Marks)**
4. With reference to static oily water separators, explain EACH of the following:
 - a) why the supply pump should be carefully selected and matched to the separator; **(2 Marks)**
 - b) how the separator achieves effective separation; **(4 Marks)**
 - c) how the physical properties of each of the fluids to be separated affects the rate and effectiveness of separation. **(4 Marks)**
5. With reference to pump selection, state TWO types of pump for EACH of the following applications, stating why they are suitable:
 - a) bilge pumping; **(2 Marks)**
 - b) cargo oil stripping; **(2 Marks)**
 - c) sewage sludge; **(2 Marks)**
 - d) lubricating oil circulating; **(2 Marks)**
 - e) sea water circulating. **(2 Marks)**

6. With reference to machinery condition monitoring systems:
- a) state what is meant by machinery condition monitoring; **(2 Marks)**
 - b) state the means available for gathering data; **(3 Marks)**
 - c) describe how the data is used to indicate machinery condition trends; **(3 Marks)**
 - d) explain the relevance of machinery condition monitoring to approved planned maintenance systems. **(2 Marks)**
7. As a newly joined Chief Engineer Officer on board a ship, how would you verify the compliance with the existing statutory requirements of the ENERGY EFFICIENCY **(10 Marks)**
8. a) State, with reasons, why water treatment is used for auxiliary boilers even when they make use of distilled feed water. **(6 Marks)**
- b) Explain the possible consequences of excessive boiler water treatment. **(4 Marks)**

SECTION-B

9. a) State the reasons why direct on line starting for large induction motors such as those for bow and stern thruster units may not be viable. **(2 Marks)**
- b) Describe, with the aid of a sketch, a starting system that may be used for such motors. **(8 Marks)**
10. With reference to A.C switchboards:
- a) state, with reasons, the protective devices that are fitted; **(5 Marks)**
 - b) state why a breaker may fail to open under prolonged low voltage conditions; **(2 Marks)**
 - c) explain the actions to be taken should a main generator circuit breaker stay connected despite repeated efforts to trip it off the board. **(3 Marks)**
11. a). List FOUR types of Electrical equipment which are acceptable to install in paint stores **(2 Marks)**
- b). Explain the meaning of EACH type listed in the above part(a) **(8 Marks)**

SECTION-C

12. Sketch and describe a typical cargo hold configuration for a single skin bulk carrier. **(10 Marks)**
13. With reference to roll reduction systems, explain the principles of operation of EACH of the following, stating the advantages and disadvantages of EACH:
- (i) Bilge keels **(5 Marks)**
 - (ii) Passive Uncontrolled Tanks **(5 Marks)**
14. With respect to Keyless Fitting of Propellers, brief on the requirements to be satisfied in the following cases;
- (i) The taper of the propeller shaft **(2 Marks)**
 - (ii) Prior to final push-up **(4 Marks)**
 - (iii) After final push-up **(4 Marks)**