



SEAGOING ENGINEER OFFICER CLASS 2

CERTIFICATE OF COMPETENCY

ENGINEERING KNOWLEDGE - GENERAL

Time allowed: 3 hours

INSTRUCTIONS :-

This paper consists of FOURTEEN questions divided into three sections where

Candidates are required to attempt not more than TEN questions as follows:

Section I (Questions 1 - 8) – Not more than SIX questions to be attempted.

Section II (Questions 9 - 11) – Not more than TWO questions to be attempted.

Section III (Questions 12 - 14) – Not more than TWO questions to be attempted.

All questions carry equal marks.

Pass marks: All Sections must not less than 50%.

CANDIDATES ARE NOT ALLOWED TO WRITE ON OR DEFACE THIS PAPER

This paper consists of this page and FIVE other printed pages.

Notes to Candidates:-

- i) Write down your name in the top right-hand corner on the first page of the answer sheets.
- ii) Write down the question number in the top left-hand corner on each page.
- iii) Answer each question on a new page.
- iv) No need to copy the questions' details onto the answer sheets.
- v) **Switch off all your mobile phones and communication devices when in the examination room.**
- vi) **Return all the question paper(s), the used and unused answer sheets before leaving the examination room.**
- vii) **Do not disturb other candidate(s) in the examination room.**
- viii) **Do not attempt to take any photos or recordings of any question papers and/or answer sheets.**
- ix) The progress of the examination is being recorded by close-circuit television (CCTV) and voice recorders in the examination room.

If the above rules from item v) to viii) are infringed, candidates will be regarded as having failed the examination as a whole and will not be accepted for re-examination for such period as may be decided by the Director.

考生注意事項：-

- i) 在答題紙首頁右上角寫上姓名。
- ii) 在每頁答題紙的左上角標明回答的問題題號。
- iii) 每一條問題另開新頁作答。
- iv) 不需要抄寫問題到答題紙上。
- v) 進入試場後，把手機及所有通信設備關閉。
- vi) 離開試場前，交回所有試卷、所有用過和未用過的答題紙及草稿紙。
- vii) 試場內不可干擾其他考生。
- viii) 切勿嘗試拍攝或錄取任何試卷或答案。
- ix) 考試期間試場內會有閉路電視(CCTV)和錄音系統進行記錄。

如果違反上述 v) 至 viii) 規則，即當作所有考試不及格，以及在處長決定的期間內不得重考。

Section I (Questions 1-8) (Passing marks for this section is 50%)

Not more than SIX questions to be attempted in this section

1.
 - (a) Draw a line diagram of an automatic sprinkler system labeling the principle items.
 - (b) Explain how it comes into automatic operation upon an outbreak of a fire.
 - (c) State the routine inspection/test to ensure its proper functioning.

2.
 - (a) Sketch a hunting gear as fitted to a hydraulic steering gear and label the principal items.
 - (b) Explain the purpose of the hunting gear.
 - (c) Explain the purpose of the buffer spring.
 - (d) State how worn pins in the hunting gear affect steering gear operation.

3. With the aid of characteristic curves give reasons why:
 - (a) axial flow pumps are at a disadvantage to their centrifugal counterparts when operating against closed discharged valves;
 - (b) axial flow pumps are at a disadvantage to their centrifugal counterparts when subject to variable mass flow rates under constant head conditions; and
 - (c) axial flow pumps possess a distinct advantage over their centrifugal counterparts when subject to variable heads under constant speed conditions.

4.
 - (a) Draw in detail a 2-stage oily water separator.
 - (b) Describe the operation principle of the oily water separator.
 - (c) State with reasons the factors affecting the separation efficiency of the oily water separator.

5.
 - (a) Identify those factors which exert a strong influence on the life of propeller shaft coupling bolts.
 - (b) State why fitted bolts are used rather than clearance bolts and dowels.
 - (c) Give reasons why propeller shaft coupling bolts may be subject to pronounced fretting of the shanks.
 - (d) State how the conditions in c. may be countered by an effective and efficient method.

6. Give reasoned opinions as to the following accuracy of each of the following statements on multi-tubular heat exchanger:

- (a) Overheating is the sole concern when tubes are partially blocked by mussels or debris;
- (b) Zinc anode should be fitted in the heat exchanger made of coated cast iron casing, aluminum-brass tubes and naval-brass tube plates when sea water is used as the coolant;
- (c) Fitting of fixed sacrificial anodes inside heat exchanger does not have any disadvantages; and
- (d) Intermediate tube plates or diaphragm make a contribution to tube life.

7. With reference to safe working practices on boilers, comment on the following aspects:

- (a) entering furnaces or flues;
- (b) opening up water side after emptying;
- (c) entering boiler which has been laid up for some time;
- (d) working on shut down boiler which is part of a multi-boiler system; and
- (e) inspecting refractory which appears loose.

Your answer should fully identify the risk(s) in such case and also give details of the precaution you would take to minimize the risk.

8. (a) Give reasons why main transmission shaft bearings occasionally become overheated.
- (b) What can the ship's engineer do to overcome this over-heating problem?
- (c) Describe a monitoring system for a shaft bearing.

Section II (Questions 9-11) (Passing marks for this section is 50%)

Not more than TWO questions to be attempted in this section

9. (a) Explain why under-voltage protection is provided in a.c. systems.
- (b) With the aid of a sketch, briefly describe how this protection is to be effected.
10. (a) State why incandescent lamps can be dimmed by simply regulating the applied voltage whereas this method cannot be used with gas discharge lamps.
- (b) State under what circumstances the assumption that, a lamp maintains its value as long as it still functions.
- (c) State FOUR factors which influence the life of gas discharge lamps.
11. (a) Describe the materials and electrolyte of an alkaline battery used on board ship
- (b) Differentiate the designs of normal and low resistance battery.
- (c) Explain the power requirement for digital and analogy apparatus respectively and hence select the appropriate type of battery to fulfill the requirement of digital apparatus.
- (d) State the advantages and disadvantages of alkaline battery.

Section III (Questions 12-14) (Passing marks for this section is 50%)

Not more than TWO questions to be attempted in this section

12. (a) Identify and briefly describe the three different corrosion problems encountered in ship structure apart from uniform corrosion.
- (b) Define the origins and significance of each.
- (c) State the precautions that can be taken to reduce their effects.
13. (a) Explain why pillars are fitted in ships.
- (b) Sketch a pillar, showing details of its head and heel attachment.
- (c) Describe whether compressive or tensile stress is the more important stress to which pillars are subjected.
14. (a) Give reasons why scuppers are generally located in close proximity to superstructure, deckhouse and other weather deck erections, whereas freeing ports are generally located in open areas of the weather deck.
- (b) Explain why it is essential that scuppers and freeing ports should function satisfactory at all time.
- (c) State why oil tankers in particular have ship guard rails abreast cargo tanks for reasons other than personnel safety.

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