



## **SEAGOING ENGINEER OFFICER CLASS 1**

### **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 DEFSACE 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) Make a simplified sketch of the essential features incorporated in a propeller shaft and boss whereby servo signals are transmitted via the revolving shaft to the controllable pitch propeller.
  - (b) State what regular maintenance and test checks are necessary to ensure maximum reliability of the gear at all times.
  
2. Describe the examinations that should be carried out on a ship in dry dock regarding to hull, hull fittings and machineries & systems underneath the sea surface, making special reference to essential maintenance and repairs that can only be carried out in dry dock.
  
3.
  - (a) Why is resonance such an important factor in assessing shipboard vibration?
  - (b) After leaving drydock, where the propeller and tailshaft had been removed for survey as well as work on the main propulsion machinery, considerable vibration occurred at the aft end.  
  
Discuss the main factors which could cause these vibrations and state the checks you would make or other things you would try to eliminate some causes so as to narrow down the possibilities.
  
4. With regard to Annex I of MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 MARPOL) as amended, explain with sketches:
  - (a) engine room bilge discharging system;

- (b) the requirements for Oily water separator and related equipment;
  - (c) the purposes of the Oil Record Book Part I and Part II; and
  - (d) defines following terms:
    - i) Oil residue;
    - ii) Oil residue tank;
    - iii) Oily bilge water; and
    - iv) Oily bilge water holding tank.
5. (a) Sketch a self-contained totally submerged pump for emptying tanks of hazardous liquid chemical cargo.
- (b) Explain why this pump is used for such service.
- (c) Identify the safety features incorporated in the pump design.
6. (a) Define following two terms: - “Hazard” and “Risk”.
- (b) Distinct between “Hazard” and “Risk”
- (c) Briefly describe the risk assessment methodology and procedures of risk assessment.
7. (a) Ventilation ducts from machinery space passing into accommodation are usually insulated to “A-60” standard. Why this standard is to be used and what does “A-60” mean?
- (b) Discuss the design of ventilation systems with reference to the prevention of spread of smoke and fire.
- (c) Describe an automatic fire damper.
8. (a) Describe how a Planned Maintenance System (PMS) is established for a new construction ship.
- (b) What is Machinery PMS Initial Survey and what are its main focus areas?

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

***Not more than TWO questions to be attempted in this section.***

9. With reference to three phase motors state with reasons:
- (a) Why the protective device for single-phasing used for star- connected motors may not be suitable for delta-connected motors;
  - (b) Describe with sketch a protective device for single-phasing suitable for delta connected motors; and
  - (c) Significance of the air gap in induction motor.
10. (a) Explain the meaning of the following terms:
- i) intrinsically safe (Type EXI) equipment;
  - ii) flameproof (Type EXD) equipment; and
  - iii) pressurised (Type EXP) equipment.
- (b) State the expected upper limits of various electrical values of intrinsically safe equipment.
- (c) Describe the situations under which the installation of flameproof (EXD) equipment is compulsory.
11. (a) Explain the automatic arrangements for the emergency generator.
- (b) State the emergency source of electrical power requirements regarding to emergency generator in accordance to the provisions in SOLAS.

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

***Not more than TWO questions to be attempted in this section.***

12. Explain the following terms:

- (a) bulkhead deck;
- (b) margin line; and
- (c) floodable length

What are the factors governing the determination of floodable length.

13. (a) Sketch a mechanically operated large metal hatch cover.  
(b) Describe how it is sealed and secured for passage.  
(c) When and how such items are required for survey inspection.
14. (a) Define and evaluate the advantages of crude oil washing over water washing for the cleaning of cargo tanks in large oil tankers.  
(b) Explain why it is necessary to clean the cargo tanks in crude petroleum carriers.  
(c) State with reasons what other factors must play an active part in the overall process of crude oil washing.

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