



**SEAGOING ENGINEER OFFICER CLASS 1**

**CERTIFICATE OF COMPETENCY**

**ENGINEERING KNOWLEDGE - MOTOR**

*Time allowed: 3 hours*

***INSTRUCTIONS :-***

This paper consists of NINE questions where

Candidates are required to attempt ANY SIX questions.

All questions carry equal marks.

*Pass marks: 50 %*

***CANDIDATES ARE NOT ALLOWED TO WRITE ON OR DEFACE THIS PAPER***

***This paper consists of this page and FOUR 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。**

1. With reference to the tie rod as used in large slow speed marine diesel engines:
  - (a) Sketch in detail a cross section through an engine in way of a pair of tie rods showing how the whole structure is held together;
  - (b) Give two reasons why the tie rods are situated as shown in the answer of 1 (a); and
  - (c) Describe with a sketch the tensioning procedure for the tie bolts of a five-cylinder engine.
  
2. With reference to fatigue of engineering components of marine diesel engine:
  - (a) Explain the influence of stress level and cyclical frequency on expected operating life;
  - (b) Explain the influence of material defects on the safe operating life of an engineering component; and
  - (c) State the factors which influence the possibility of fatigue cracking of a bedplate transverse girder and explain how the risk of such cracking can be minimized.
  
3. With reference to diesel engine maintenance:
  - (a) Describe the various means that are available to check the condition of a diesel engine as a guide to when maintenance is actually needed; and
  - (b) Compare the methods described in part (a) with the use of planned maintenance schemes.
  
4. The unattended machinery spaces (UMS) monitoring and control system of your ship has recently started to give false alarms and incorrect data printouts:
  - (a) State, with reasons, possible causes if the false alarms and readings are
    - i) localised to a particular area of engine operation; and
    - ii) general to the engine room.
  - (b) State, with reasons, the action you, as Chief Engineer, would take to ensure continued safe operation of the vessel if the defects were general to the engine room; and
  - (c) Explain the procedure you, as Chief Engineer, would adopt in order to locate and rectify a general fault in the UMS system.

5. (a) State the rules for the starting air system regarding to starting air bottles and main air compressors.
- (b) What are the safety devices incorporated in the compressed air system including the starting air system?
6. With reference to starting and reversing of a main propulsion slow speed diesel engine:
- (a) Sketch a typical system and label all major components;
- (b) Explain how reversing of the engine is achieved; and
- (c) Define the purpose of interlocks and blocking devices incorporated in the system.
7. With reference to torsional vibrations in a main propulsion installation based on medium speed engines, gearbox and controllable pitch propeller:
- (a) Explain how the vibrations may be caused;
- (b) State the possible effects and damage that could result;
- (c) Discuss the methods employed to minimise the potential problems associated with torsional vibration; and
- (d) Describe how the natural frequency of the system could be modified.
8. (a) Specify with reasons those parts requiring particularly close scrutiny during internal and external examinations of oil fired water tube auxiliary boilers.
- (b) Explain the causes of metal failure of a boiler due to
- i) corrosion fatigue; and
- ii) overheating.

9. Explain how and why the performances of reciprocating air compressors tend to “fall off” in service.

State how “fall off” is identified and to what extent permissible before correction.

Describe how optimum performance is restored.

- END -

SAMPLE