

# CERTIFICATE OF COMPETENCY EXAMINATION

EXAMINATIONS ADMINISTERED BY THE  
SCOTTISH QUALIFICATIONS AUTHORITY  
ON BEHALF OF  
MARITIME AND COASTGUARD AGENCY  
MANAGEMENT ENGINEER (UNLIMITED)

040-13 - ENGINEERING KNOWLEDGE - MOTOR

TUESDAY, 22 October 2024

0915-1215 hrs

## Examination paper inserts:

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## Notes for the guidance of candidates:

Candidates should note that 96 marks are allocated to this paper. To pass candidates must achieve 48 marks.

## Materials to be supplied by examination centres:

Candidate's examination workbook

## ENGINEERING KNOWLEDGE - MOTOR

Attempt SIX questions only

Marks for each part question are shown in brackets

1. In a multi engine installation one engine is showing higher Specific Fuel Consumption (SFC) than the other engines. All engines take fuel oil from the same fuel oil service tank and each engine has an individual dedicated fuel supply unit of the same make and type.
  - (a) Explain with reasons the possible causes for one engine having a higher specific fuel consumption than the other engines. (8)
  - (b) State with reasons how the cause of the higher SFC can be detected (8)
  
2. Describe FOUR defects which may be found during a piston/liner inspection via cylinder scavenge ports, explaining the possible causes and the action which should be taken to prevent their re-occurrence. (16)
  
3.
  - (a) Describe, with the aid of a sketch, a diesel engine fuel system which employs direct injection of liquid gas into engine cylinders. (12)
  - (b) Explain the advantages of this type of gas injection system compared with the use of gaseous fuel in the form of gas. (4)
  
4. With reference to turbocharger systems:
  - (a) describe how performance of the system is monitored and how the information gathered is used to assess performance; (8)
  - (b) describe the arrangements for maintaining the systems in good condition. (8)
  
5.
  - (a) Describe, with the aid of a sketch, a diesel engine NO<sub>x</sub> reduction system, using chemical supply, explaining the safety and pollution avoidance systems required. (12)
  - (b) Explain chemical reactions involved in the NO<sub>x</sub> reduction system described in part (a) of the question. (4)
  
6.
  - (a) Describe, with the aid of a sketch, the HT and LT cooling water systems for a combined pair of medium speed engines in an installation. (12)
  - (b) For the system described in part (a), explain how a shut-down engine is maintained at the correct temperature for immediate starting when the associated engine is also stopped and when the associated engine is running. (4)

7. (a) Explain why top bracing is used for large crosshead engines. (4)
- (b) Describe, with the aid of a sketch, a hydraulic top bracing unit for a large crosshead engine indicating where the top bracing is fitted and how it operates. (6)
- (c) Write instructions for the checking of a large crosshead engine hydraulic top bracing system and a holding down system. (6)
8. (a) Describe, with the aid of a sketch, a lubrication system for a trunk-piston engine which has an automatic standby capability. (8)
- (b) Describe, with the aid of a sketch, a cylinder lubrication system for a cross-head engine, explaining why a separate cylinder LO system is fitted. (8)
9. Write a procedure for the actions to be taken in the event of an engine oil mist detector alarm being activated, stating the reasons for EACH action. The procedure must cover the period from activation of the alarm to return of the engine to normal operation. (16)