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, 01 April 2025

0915-1215 hrs

Examination paper inserts:

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. As Chief Engineer Officer outline a procedure for the changing of a cylinder liner in a large crosshead diesel engine after the removal of the cylinder cover to the replacement of the liner. (16)

2. (a) Describe, with the aid of a sketch, a main engine fuel oil circulating system incorporating the MGO and HFO service tanks, a fuel oil change-over system, heating and viscosity control system and tank return system. (10)

   (b) Write instructions for changing the system described in part (a) of the question from MGO to HFO, indicating the checks to be made during the changeover. (6)

3. With reference to engine operation:

   (a) state, with reasons, the symptoms which would indicate a cylinder head was cracked between the combustion chamber and the water space; (4)

   (b) describe the actions that should be taken if the engine with the symptoms in part (a) cannot be immediately stopped; (6)

   (c) write a report to the Superintendent outlining the probable cause and actions to prevent further occurrence. (6)

4. (a) List TWO automatic main engine *slowdown* parameters, stating why EACH is applied to an engine. (4)

   (b) List TWO automatic main engine *shutdown* parameters, stating why EACH is applied to an engine. (4)

   (c) Explain how EACH of the parameters listed in part (a) and part (b) are tested for the correct operation. (8)

5. (a) Describe the sequence of events that may lead to a crankcase explosion. (6)

   (b) Describe an oil mist detector, explaining how it operates. (8)

   (c) Describe how an oil mist detector operation is checked for accuracy. (2)

6. A significant number of machinery failures are due to poor maintenance techniques. State, with reasons, the possible consequences of poor maintenance techniques on EACH of the following:

(a) main engine lubricating oil self cleaning filters; (4)

(b) cylinder liner honing; (4)

(c) auxiliary engine bottom end bearing overhaul; (4)

(d) fitting of piston compression and oil control rings. (4)

7. (a) Describe how crosshead bearing and guide clearances can be checked. (6)

(b) Describe, with the aid of a sketch, the procedure for checking the condition of a crosshead engine bottom end bearing surface. (10)

8. (a) Explain why cylinder power balance is essential to good engine operation, indicating the possible damaging effects of cylinder power imbalance. (6)

(b) Describe the procedure for checking the performance and power of an engine cylinder. (4)

(c) Explain how cylinder power may be balanced across an engine. (6)

9. As Chief Engineer Officer write a report to the Engineering Superintendent regarding TWO incidents of failure of the main propulsion engine to start in the reverse direction during a recent manoeuvring session whilst entering port. The report must cover details of the manoeuvring control situation at the time of the incidents and the immediate action taken to ensure the safety of the ship. The report must also detail the actions taken by the Chief Engineer to ensure that the cause of the problem was detected and rectified. Details must be included in the report about the actions you, as Chief Engineer, have taken to minimise future similar occurrences. (16)