

**CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY -
MARINE ENGINEER OFFICER**

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF
MARITIME AND COASTGUARD AGENCY

SECOND ENGINEER (UNLIMITED)

042-27 - ENGINEERING KNOWLEDGE - GENERAL

MONDAY, 10 December 2012

0915-1215 hrs

Examination paper inserts:

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Notes for the guidance of candidates:

Candidates are required to obtain 50% of the total marks allocated to this paper to gain a pass AND also obtain a minimum 40% in Sections A, B and C of the paper.

Materials to be supplied by examination centres:

Candidate's examination workbook

ENGINEERING KNOWLEDGE - GENERAL

Attempt TEN questions only as follows:

SIX questions from section A

TWO questions from section B

TWO questions from section C

Marks for each part question are shown in brackets

Section A

1. Describe, with the aid of a sketch, a two stage emergency fire pump which utilises a hydraulic pump and motor and is suitable for use in very large ships. (10)

2. With reference to propeller shaft support bearings:
 - (a) sketch a bearing of the tilting pad design, showing how the oil pressure is distributed; (6)
 - (b) explain why this type of bearing evolved, stating the advantages over plain bearings. (4)

3.
 - (a) Sketch a four ram electro-hydraulic steering gear system. (5)
 - (b) Explain the operations necessary to enable a four ram system to operate on two rams only. (3)
 - (c) State the regulations pertaining to the main and auxiliary steering gear with reference to the rudder angle and time of operation. (2)

4. With reference to positive displacement pumps suitable for bilge duties:
 - (a) sketch a progressive cavity (Mono) pump; (5)
 - (b) explain why the pump drive requires universal joints; (3)
 - (c) state the consequences of this type of pump being allowed to run dry. (2)

5. Explain how EACH of the following conditions affect the performance of lubricating oil centrifuges:
- (a) worn friction pads; (2)
 - (b) impurities build up in the bowl; (2)
 - (c) excess feed rate to the bowl; (2)
 - (d) incorrect oil temperature; (2)
 - (e) incorrect paring disc height. (2)
6. Describe how a ship's refrigeration system is charged with refrigerant gas, stating whether the gas is zeotropic or azeotropic. (10)
7. With reference to lifeboat engines:
- (a) state THREE reasons that may contribute to difficulty in starting; (3)
 - (b) explain why a short run as part of routine testing does not give a true indication of the engine condition; (4)
 - (c) describe how the engines are kept at a state of full readiness. (3)
8. With reference to hydraulic deck machinery and cargo handling systems:
- (a) state FOUR possible types of contamination of the oil, describing how the contamination may have occurred; (4)
 - (b) state FOUR possible effects of oil contamination on the system; (4)
 - (c) state how the system oil may be monitored for contamination. (2)

Section B

9. (a) Sketch a labelled block diagram of essential services provided from an emergency generator. (7)
- (b) State the regulations pertaining to the emergency generator starting and running requirements. (3)
10. Explain, with the aid of a circuit diagram, the operation of a synchroscope. (10)
11. With reference to a.c. induction motors:
- (a) state, with reasons, the type of fuses used for protection; (3)
- (b) explain the effects of single phasing; (2)
- (c) describe how thermistors can be used to protect the motor; (3)
- (d) sketch a thermistor as described in part (c). (2)

Section C

12. With reference to weathertight doors:
- (a) sketch a weathertight door; (4)
 - (b) sketch the edge sealing arrangement; (2)
 - (c) state the routine maintenance required; (2)
 - (d) describe how the function may be tested. (2)
13. (a) State why bulwarks are fitted to ships' decks. (2)
- (b) Sketch EACH of the following types of bulwark:
- (i) open; (4)
 - (ii) floating. (4)
14. With reference to ship construction, explain the purpose of EACH of the following, stating where they are located:
- (a) duct keel; (2)
 - (b) bilge keel; (2)
 - (c) collision bulkhead; (2)
 - (d) deck camber; (2)
 - (e) bow flare. (2)