

# **CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)**

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

**SMALL VESSEL SECOND ENGINEER**

**060-01 - MARINE DIESEL ENGINEERING**

**FRIDAY, 08 February 2019**

**1400-1600 hrs**

Examination paper inserts:

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Notes for the guidance of candidates:

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| <ol style="list-style-type: none"><li>1. Non-programmable calculators may be used.</li><li>2. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.</li></ol> |
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Materials to be supplied by examination centres:

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## MARINE DIESEL ENGINEERING

Attempt ALL questions

Marks for each part question are shown in brackets

1. (a) Sketch a four stroke timing diagram, showing the position of fuel valve, exhaust valve and inlet valve operation. (8)
- (b) Explain the meaning of the term *valve overlap*, stating its purpose. (2)
  
2. With reference to a turbocharged engine fitted with charge air cooler, It is noticed that boost pressure at the inlet manifold is reducing over a period of time:
  - (a) list FOUR possible causes; stating a simple and economical in service maintenance routine that would rectify EACH (8)
  - (b) state the effect reduced inlet pressure at full load will have on the engine. (2)
  
3. (a) State THREE desirable properties of piston rings. (3)
- (b) State the materials commonly used for piston rings. (2)
- (c) Sketch THREE different types of piston ring ends. (3)
- (d) Explain why piston ring end clearance is necessary. (2)
  
4. List TEN safety devices that may be fitted to a propulsion engine and gearbox arrangement, stating a reason why EACH device is fitted. (10)
  
5. With reference to diesel engine fuel injection pumps:
  - (a) sketch the position of the plunger at EACH of the following points:
    - (i) start of fuel delivery; (3)
    - (ii) end of fuel delivery; (3)
  - (b) explain how the timing of fuel delivery is adjusted. (4)

6. Describe, with the aid of a sketch, a coalescer type distillate fuel oil filter. (10)
7. Describe, with the aid of a sketch, the operation of a pre-engage diesel engine electric starting system, labelling the main components. (10)
8. With reference to turbochargers:
- (a) explain the term *surging*; (5)
  - (b) describe the indications of *surging*; (2)
  - (c) describe the causes of *surging*. (3)
9. Sketch a hydraulically operated, multi-plate, friction clutch, labelling the main components. (10)
10. With reference to reduction gearing:
- (a) explain the purpose of the magnetic filter in the lubricating oil system; (3)
  - (b) explain why the surface finish of the gear teeth is important; (4)
  - (c) state why a flexible coupling is fitted between the engine and gearbox. (3)