



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA
CERTIFICATE OF COMPETENCY EXAMINATION**

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)

SUBJECT : Engine and control systems

DATE : 06th February 2018 Time : 0900 hrs

Time allowed **THREE** hours Total marks : 96

Answer **8 questions** including mandatory **question no 10** Pass marks : 50%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required. Electronic devices capable of storing and retrieving are **NOT** allowed.

1.
 - a) Sketch and describe the two stroke and four stroke timing diagrams of a Diesel engine. (08 marks)
 - b) Explain the advantages of having “over lapping” with regard to timing diagram of 2S diesel Engine. (02 marks)
 - c) Explain the term Compression Ignition Engine (CI Engines). (02 marks)

2.
 - a) Explain the properties of the refrigerants use onboard. (02 marks)
 - b) Sketch and describe the basic refrigeration system diagram. (08 marks)
 - c) What are the safety devices on a Compressor and describe their purposes? (02 marks)

3.
 - a) Explain the term of Turbo charging with regard to diesel engines and its advantages. (04 marks)
 - b) What is Turbo Charger surging and how it is occurred? (02 marks)
 - c) Briefly sketch and describe the Scavenging methods of two stroke engines and explain what is the most efficient method and it’s advantage. (06 marks)

- 4.
- a) Draw and explain a Fresh Water Generator system onboard. (06 marks)
 - b) How do you make the generated fresh water drinkable? (03 marks)
 - c) Explain the preparation, cleaning and inspection of Fresh water storage tanks onboard. (03 marks)
- 5.
- a) Sketch and describe the Engine lub oil system onboard. (06 marks)
 - b) Why there is a three-way valve in the above system? (02 marks)
 - c) What are the main purposes of using oil system in the Engine? (04 marks)
- 6.
- a) Briefly explain how Up-take fire can be occurred onboard? (04 marks)
 - b) What are the actions to be taken when there is an Up-take fire? (04 marks)
 - c) Briefly explain with the aid of fire triangle how scavenge fire can be started? (04 marks)
- 7.
- a) Define the terms frequency and periodic time. (02 marks)
 - b) A 230 V, 50 Hz a.c. supply is applied to a coil of 0.06 H inductance and 2.5-ohm resistance connected in series with a 6.8 μ F capacitor. Calculate;
 - i. impedance
 - ii. current
 - iii. phase angle between current and voltage
 - iv. power factor
 - v. power consumption(10 marks)

- 8.
- a) Explain the type of Fuel used onboard. (04 marks)
 - b) Explain the important characteristics of fuel oil. (04 marks)
 - c) Explain the abbreviated form of fuel **ISO -F-RMG 380**? (04 marks)
- 9.
- a) Briefly explain the SEEMP. (03 marks)
 - b) What are the factors can be influenced on SEEMP onboard and how you can improve it? (07 marks)
 - c) How do you control the emission of SO_x onboard? (02 marks)
10. Following card areas were obtained from power cards taken from a 6-cylinder slow speed diesel engine.

Cyl number	1	2	3	4	5	6
Area in mm²	3200	3195	3245	3131	3165	1260

Card length : 120 mm
 Diameter of the cylinder : 1000 mm
 Piston stroke : 2200 mm
 Spring constant : 95 KN/m² per mm
 Engine RPM : 110 rpm

- a) Calculate the total power (Indicated power) developed by the engine. (10 marks)
- b) What will be the consequences, if an engine continues to operate in this condition? (02 marks)