



**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 : 18/04/2022

Time : 1000 hrs

Time allowed **THREE** hours

Total marks : 100

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 timing diagram. (06 marks)
- b) Explain and Show the valve overlapping angle in above diagram (03 marks)
- c) What is the difference between SI Engine and CI engine? (03 marks)

2.

- a) What are the main advantages of having turbochargers on modern diesel engines? (04 marks)
- b) Why do auxiliary blowers required to installed in two stroke main engine scavenging system? (02 marks)
- c) Briefly explain with suitable sketches different types of scavenging systems for large two stroke diesel Engines. (06 arks)

3.

- a) Sketch and describe any type of marine boiler with the boiler mountings (06 marks)
- b) Briefly explain the functions of 4 important mountings among them. (04 marks)
- c) Why is boiler water treatment required? (02 marks)

4.

- a) Sketch and describe a freshwater generator widely used in marine industry.

- b) What is the function of salinometer ? (08 marks)
- c) How do you make this water into portable water? (02 marks)
5. c) How do you make this water into portable water? (02 marks)
5. a) What are the key features of Ship Energy Efficiency Management Plan? (04 marks)
- b) How to implement SEEMP? (04 marks)
- c) What are the methods and technologies used to reduce SOx Emissions from marine engines? (04 marks)
6. a) What are the characteristics of lubricating oil in diesel engines? (03 marks)
- b) Sketch and explain the lubricating oil system of a diesel engine showing all important components. (07 marks)
- c) Explain how desired temperature is controlled in the system? (02 marks)
7. a) Draw and explain ship's AC power distribution system. (06 marks)
- b) Sketch three types of DC motors. (03 marks)
- c) State the characteristics of above motors. (03 marks)

8.

- a) With regards to steering system, name the main components which are included in the telemotor control system and their functions. (04 marks)
- b) What are the ship steering gear regulations? (04 marks)
- c) What are the checks that should be carried out on steering system before leaving a port? (04 marks)

9.

- a) What is the meaning of a comfort zone with regards to air condition system? (02 marks)
- b) Make a detailed sketch of a ref. cycle and explain the function of each component. (10 marks)

10. When taking indicator cards of a 6 Cylinder slow speed diesel engine, following information were obtained.

Cylinder No.	1	2	3	4	5	6
Area in mm ²	5400	5300	5400	5000	5350	5400

Card length : 100 mm
Diameter of the cylinder : 900 mm
Piston stroke : 1600 mm
Spring constant : 40 KN/m² per mm
RPM : 120

- (a) Calculate the power developed by each cylinder. (10 marks)
- (b) Total power developed by the engine (02 marks)
- (c) What will be the outcome, if engine continue to operate in this condition for an extended period? (04 marks)

