



**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 : 10th Jun 2020

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) List down 4 -stroke of a diesel engine. (04 marks)
- (b) Briefly explain the job of crankshaft and camshaft. (02 marks)
- (c) Sketch and describe four-stroke valve timing diagram of a Diesel engine. (06 marks)

- 2) (a) Modern engines are installed with turbochargers. List down the main advantages of having turbochargers on modern diesel engines. (04 marks)
- (b) What is the purpose of auxiliary blowers installed in main engine scavenging system? (02 marks)
- (c) Briefly explain with suitable sketches different types of scavenging systems for large two stroke diesel Engine. (06 marks)

- 3) (a) List down the use of steam on board for machinery operations and other uses. (06 marks)
- (b) Briefly explain the functions of FOUR important boiler mountings. (04 marks)
- (c) How do we control the corrosion in the boiler? (02 marks)

- 4) (a) Sketch and describe a fresh water generator widely used in marine industry. (08 marks)
- (b) What is the purpose of keeping this water in specific tanks? (02 marks)
- © How do you make this water into potable water? (02 marks)
- 5) a) The instantaneous voltage across power system is given by $v = 400\sin 314t$.
- Determine the V_{rms} and frequency. (04 marks)
- b) A pure inductance of 318mH is connected in series with a pure resistance of 75Ω .
The circuit is supplied from 50Hz source and the voltage across 75Ω resistor is found to be 150V. Calculate the supply voltage and the phase angle. (08 marks)
- 6) (a) What are the functions of lubricating oil in diesel engines? (03 marks)
- (b) Make a detailed sketch of a lubricating oil system of a diesel engine showing all important components. (07 marks)
- © 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)
- © State the characteristics of above motors. (03 marks)
- 8) (a) With regarding steering system, name the main components which are included in the telemotor control system and their function. (04 marks)
- (b) Name main alarms and indication on steering gear system. (04 marks)
- © 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 regarding air condition system?
(02 marks)
- (b) Make a detailed sketch of a ref. cycle and explain the function of each component.
(10 marks)

10) An engine with seven cylinders (slow speed) has been indicated 5410 revolutions over a period of 45 minutes. During this time, power cards have been taken in all the cylinders. Following are the data taken from the cards and engine.

Average card area	: 17.2 sq.cm
Card length	: 42mm
Diameter of the cylinder	: 600mm
Piston stroke	: 2450mm
Spring constant	: 20.5×10^5 N/m ² /cm

What is the total indicated power of the engine?

(16 marks)