



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

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)  
SUBJECT : Ship Construction  
DATE : June 2020

Time allowed **THREE** hours

Total marks : 120

**ANSWER ANY SIX QUESTIONS**

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) With reference to structural fire protection in passenger ship accommodation space;
  - a) define the meaning of class A bulkhead  
(06 marks)
  - b) discuss the design of ventilation systems to prevent the spread of smoke and fire.  
(10 marks)
  - c) When A class bulkheads have to be penetrated explain how the integrity of the bulkhead is retained with respect to ventilation trunkings?  
(04 marks)
- 2) (a) Explain the two types of stern constructions.  
(06 marks)  
(b) Sketch stern construction arrangement of a ship and describe.  
(14 marks)
- 3) (a) Give FIVE functions of transverse water tight bulkheads.  
(5 marks)  
(b) Describe, with an aid of a sketch, how an electric cable is passed through a water tight bulk head.  
(5 marks)  
(c) Sketch and describe corrugated water tight bulkhead showing all strengthen members.  
(10marks)
- 4) Answer the following questions with regards to Ref cargo ship.
  - a) Sketch and describe mid ship section of a Ref. cargo ship.  
(10 marks)
  - b) How subsequent decks are supported above tank top?  
(02 marks)
  - c) With an aid of a sketch show how insulating system of shell plating and tank- top is achieved? Name insulating material and advantages of it.  
(08 marks)

- 5) With reference to corrosion in ship's hull;
- a) describe two ways of preventing corrosion. (04 marks)
  - b) what is the meaning of cathodic protection? (04 marks)
  - c) sketch and describe an impressed current system employed in a commercial vessel in order to control corrosion. (12 marks)
- 6)
- a) Using a stress- strain graph for a typical ductile material such as low carbon steel, identify and locate the following points and regions on the curve.
    - i. Proportionality limit
    - ii. Elastic limit
    - iii. Ultimate tensile strength
    - iv. Fracture point
    - v. Elastic behaviour
    - vi. Plastic behaviour(01 mark each)
  - b) Briefly describe two fusion welding methods used in ship construction. (08 marks)
  - c) "Percentage of Carbon plays a vital role in changing the properties of iron/steel". Sketch a graph showing the changing properties of *hardness, tensile strength, and ductility* of steel with the increase of carbon percentage. (06 marks)
- 7)
- (a) A ship at sea is subjected to a numerus forces causing the structure to distort.
    - (i) Name two major **forces** acting on ship's structure when afloat in calm waters. (04 marks)
    - (ii) What are the two main longitudinal stresses existing on a ship's hull? (02 marks)
    - (iii) Describe the reasons for initiating those above stresses? (06 marks)
  - (b) Describe the meaning of Panting and Pounding, and how the structure is designed to withstand those forces? (08 marks)

- 8)
- a) With regarding water tight doors, below the water line describe the methods adopted to achieve the strength at a water tight door opening. (04 marks)
  - b) Sketch and describe operation of hydraulically operated water tight door. (12 marks)
  - c) What maintenance and inspections are carried out on above (b) doors? (04 marks)
- 9) Briefly explain the purpose of following features included in a ship's structure. You may use suitable sketches where necessary.
- a) Double bottom tank
  - b) Duct keel
  - c) Longitudinal girders and shell plating
  - d) Solid floors and bracket floors.
  - e) Collision bulk head
- (04 marks each)