



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 4 Examination in Engineering: December 2022

Module Number: MN4306

**Module Name: Ship Design and Construction
Technology - I**

[Three Hours]

[Answer FIVE questions, the maximum marks carries 100]

Instructions to Candidates:

- This question paper contains six questions and five pages including this page.
- Answer any FIVE questions.
- Maximum marks allocated for each section of questions are shown.
- Drawings and sketches should be clear, neat and in approximate proportion.
- Use marine colour code for sketches and plans. Red colour is allowed only for sketches.
- Start your answers to each question on a fresh page.
- All questions carry equal marks.
- Clear labelled sketches will be given credits.

Q1 a) Discuss the influence of "Strength/weight" ratio and "Section of Modulus" over the construction of vessels.

[4 marks]

b) State the type of rolled steel and fabricated sections used with stiffeners showing corresponding designations of each.

[4 marks]

c) Draw and label the transverse midship section of a dry cargo vessel showing main Frames.

[6 marks]

d) State the function, construction and location of the following principal structural members of a ship,

- (i) Hatch side girder
- (ii) Lightning holes
- (iii) Intercostal Side girder
- (iv) Flat plate keels
- (v) Scallops
- (vi) Struts

[6 marks]

Q2 a) What are the main functions of (i) fore peak (ii) after peak (iii) deep tank and (iv) double bottom? Give examples of the liquids carried in these tanks.

[4 marks]

b) Draw an outline midship section of a ship and show the position of the following items.

- (i) Sheer strake
- (ii) Garboard strake
- (iii) Stringer
- (iv) Bilge plating
- (v) Keel plate
- (vi) Floor

(vii) Frames.

[8 marks]

- c) Sketch and describe the different floors used in the construction of a double bottom indicating where each type is employed. Give details of attachments of the floors to the adjacent structure.

[8 marks]

- Q3 a) State with reasons why a hatch of a dry cargo ship is unsuitable to transport bulk cargos such as cement, grains etc. Discuss the special constructional arrangements performed with bulk carrier cargo tanks in order to justify your reasons given with the help of suitable sketches.

[8 marks]

- b) Sketch the double-bottom construction with a longitudinal framing system, name the most important components and describe its function and contribution for strength of the ship.

[8 marks]

- c) Give a number of examples of different loads on a ship that may each make a contribution to the total local stresses found.

[4 marks]

- Q4 a) The ship lying at sea or in still water is being constantly subjected to the wide variety of stresses and strains. Explain following effects accordingly.

- (i) Bending moment in a seaway
- (ii) Transverse stresses
- (iii) Hogging
- (iv) Sagging
- (v) Racking
- (vi) Panting
- (vii) Pounding

[6 marks]

- b) Why water tight bulk heads are required in a ship construction?
[2 marks]
- c) State the type of bulkheads used during construction and respective locations in a vessel.
[4 marks]
- d) Explain the stresses that a ship is subject to at the forward end of a large cargo vessel and show with the aid of a sketch the structural members that form the construction of the vessel to withstand these stresses.
[8 marks]
- Q5 a) State and draw type of weld symbols illustrating butt, fillet and corner joints used in ship construction process
[4 marks]
- b) Defects may occur during welding which affect the quality and hardness of plates. State type of destructive testing carried out in ship building.
[6 marks]
- c) Explain the root and face bend tests with suitable diagrams.
[4 marks]
- d) Explain wet type underwater welding system used in ship repairing process with an appropriate circuit diagram. State with reasons the type of polarity of current being used for electrode holder.
[6 marks]
- Q6 a) Identify the components from 1 to 9 marked on the Figure Q6 and explain their construction.
[6 marks]
- b) Explain the duct keel construction identifying its members.
[4 marks]
- c) With reference to aft end construction describe the members which are normally found in aft peak Tank construction.
[6 marks]

d) Why do all ships have their rudders placed at the aft of their propellers?

[4 marks]

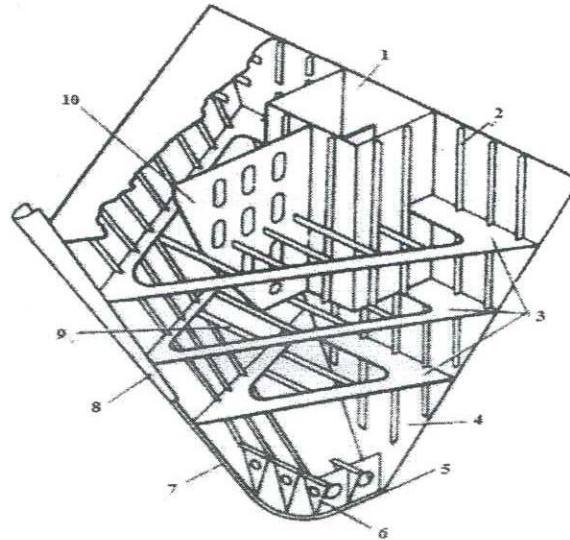


Figure Q6