UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

OCTOBER 2025 SEMESTER SESSION

SUBJECT CODE	:	**LNB22103 / LNB21303**
SUBJECT TITLE	:	**SHIP STRUCTURE**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BACHELOR OF ENGINEERING TECHNOLOGY (NAVAL ARCHITECTURE AND SHIPBUILDING) WITH HONOURS**
TIME / DURATION	:	**3.00 PM - 6.00 PM (3 HOURS)**
DATE	:	**23 JANUARY 2026**

INSTRUCTIONS TO CANDIDATES

1. Please read the instruction given in the question paper **CAREFULLY**.
2. This question paper is printed on both side of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. Answer **FIVE (5)** questions **ONLY**.
6. Answer **ALL** questions in English.
7. The formula has been appended for your reference.

THERE ARE 9 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

Question 1

With reference to the ship bending moment

(a) List three (3) basic modes of ship failure?

(6 marks)

(b) The LBP of the ship is 195 m and the beam is 28 m and block coefficient 0.8. The weight of hull, superstructure and crane are 5050 tonnes, 750 tonnes and 50 tonnes respectively. The hull, superstructure and derrick located at LCG 25 m, 4.5 m aft and 28.5 m fwd from amidships, respectively. The mean LCB is 27.25 m from amidships. Values of the constant b are: hogging 9.795 and sagging 11.02.

By using Murray's Method, please calculate the longitudinal bending moments amidships for the ship on a standard wave with the crest amidships and the through amidships. The data for the ship are as follows:

Table 1

Item	Weight (tonnes)	LCG from amidships
Hold No. 1	1800	55.0 m aft
Hold No. 2	3200	25.5 m fwd
Hold No. 3	1200	5.5 m fwd
Hold No. 4	2200	24.0 m aft
Hold No. 5	1500	50.0 m aft
Hold No. 6	2750	75.0 m fwd
Machinery	1500	7.5 m aft
Fuel Tank	400	8.0 m aft
Fresh Water Tank	150	10.0 m fwd

(14 marks)

Question 2

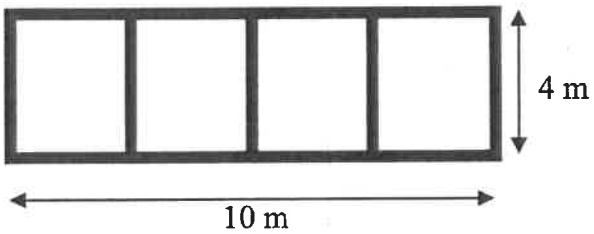
With reference to the ship stress and section modulus

a) Sketch, label and explain the meaning of:
   i) hogging (4 marks)
   ii) sagging (4 marks)

b) Figure 1 shows a cross section of a pontoon installed with 5 equally spaced longitudinal watertight bulkheads used by army for floating bridge for river crossing of dimension as shown. Each pontoon is designed to withstand a maximum bending moment of 350 MNm for track-wheeled armoured vehicles. Calculate the second moment of area and the stresses on the keel and the main deck subjected to the pontoon. The thickness of the top and the bottom decks is 25 mm the bulkheadss are 20 mm thick.

(12 marks)

Figure 1



SECTION B (Total: 60 marks)
INSTRUCTION: Answer only THREE (3) questions

Question 3

With reference to the ship structures.

(a) State three (2) principal functions of ship structure.

(4 marks)

(b) List all the structural components for the midship section below (see Figure 2).

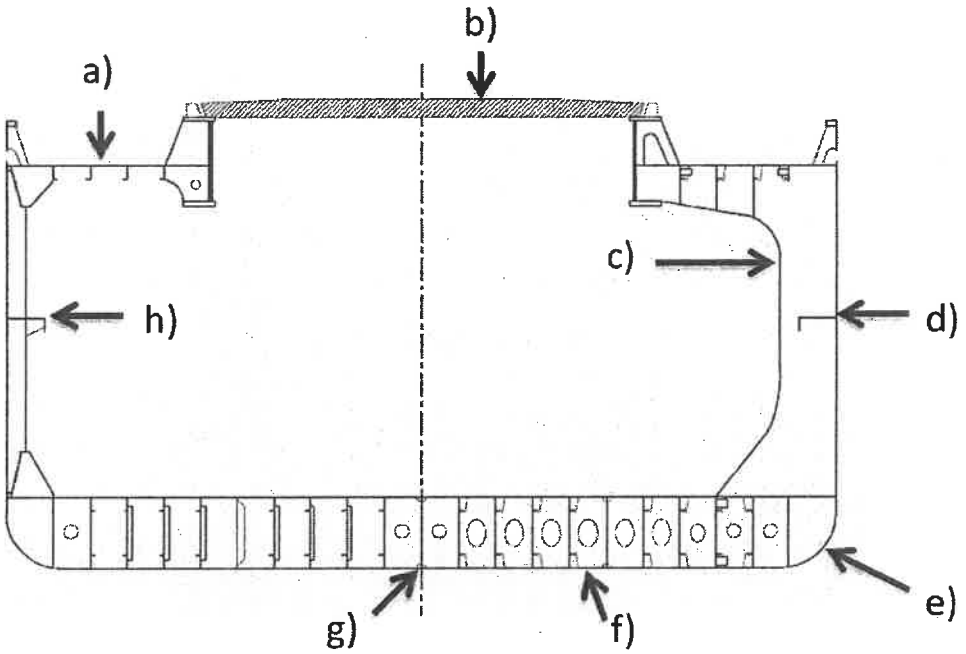


Figure 2

(16 marks)

Question 4

With reference to the forces on ship hull

a) A stress concentration in ships had become problematic issues to designers and ship operators and many ships and life were lost due to the effects. The problems arise mainly due to discontinuity structurally or materially.

i) Explain the two types of structural discontinuities exist in ships.

(2 marks)

ii) State two of the many eventual outcomes as a result of stress concentration.

(2 marks)

b) Please refer to the Figure 3 below

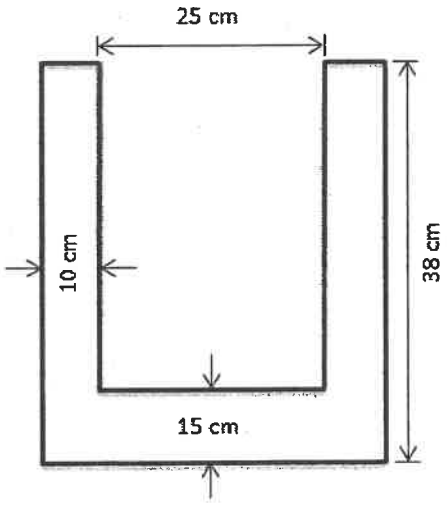


Figure 3

The channel above (Figure 2) is to be used as stiffener for bulk carrier vessel. Calculate;

a) The True Neutral Axis
b) The Moment of Inertia about the Neutral Axis

(16 marks)

Question 5

With reference to the ship design and construction

a) State five (5) design constraints that engineer and designer need to consider during ship construction processes.

(5 marks)

b) In brief, explain what is Keel. Give three (3) types of keel normally used in ship construction?

(5 marks)

c) Briefly describe the difference between dockyard and shipyards

(4 marks)

d) Specify the two main categories of storage facilities available in a shipyard.

(4 marks)

e) Specify a 'build plan' as a method of construction of a ship.

(2 marks)

Question 6

With reference to the ship construction.

a) Briefly, define what corrosion is?

(3 marks)

b) Discuss the types of materials that are used in the construction of a merchant ship.

(10 marks)

c) Discuss and sketch the anchor handling arrangements.

(7 marks)

END OF QUESTION

LIST OF FORMULAE / TABLE

Shape	Moment of Inertia of area, I
Circle	$\frac{\pi d^4}{64}$ @ $\frac{\pi r^4}{4}$
Square	$\frac{a^4}{12}$
Rectangle	$\frac{bh^3}{12}$
Triangle	$\frac{bh^3}{36}$

Mean Buoyancy Moment	$M_B = \frac{W}{2} x\ LCB$
Mean Weight Moment	$M_w = \frac{WF+WA}{2}$
Wave Bending Moment	$WBM = b*B*L^{2.5}x10^{-3}$

Moment Distribution Principle	
Principle 1	$M_{AB} = \frac{1}{2} M_{BA}$
Principle 2	$M_{BA} = 4E \tan\theta \frac{I}{L}$
Principle 3	$M_{BA} = 3E\theta \frac{I}{L}$
Principle 4	$M_{AB} = M_{BA} = \frac{6EId}{L^2}$
Principle 5	$M_{BA} = \frac{3EId}{L^2} = \frac{6EId}{2L^2}$

Load; $EI\frac{d^4y}{dx^4}$
Shear Force; $EI\frac{d^3y}{dx^3} = wx + A$
Bending Moment; $EI\frac{d^2y}{dx^2} = \frac{wx^3}{2} + Ax + B$
Slope; $EI\frac{dy}{dx} = \frac{wx^3}{6} + \frac{Ax^2}{2} + Bx + C$
Deflection; $EI\,y = \frac{wx^4}{24} + \frac{Ax^3}{6} + \frac{Bx^2}{2} + Cx + D$

$\frac{\sigma}{y} = \frac{M}{I} = \frac{M}{Z}$

Load Type (1)	Factor Involved (2)	Energy Equation Constant Factors (3)
Axial	P, E, A	$U = P^2L / 2EA$
Bending	M, E, I	$U = M^2L / 2EI$
Torsion	T, G, K'	$U = T^2L / 2GK'$
Transverse shear (rectangular section)	V, G, A	$U = 3V^2L / 5GA$

C_b	Values of b	
	Hogging	Sagging
0.80	10.555	11.821
0.78	10.238	11.505
0.76	9.943	11.188
0.74	9.647	10.850
0.72	9.329	10.513
0.70	9.014	10.175
0.68	8.716	9.858
0.66	8.402	9.541
0.64	8.106	9.204
0.62	7.790	8.887
0.60	7.494	8.571

Murray's coefficient 'b' value