CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

MARCH 2025 SEMESTER SESSION

SUBJECT CODE	:	**LNB20603**
SUBJECT TITLE	:	**NAVAL ARCHITECTURE 2**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BET (NAVAL ARCHITECTURE AND SHIPBUILDING) WITH HONOURS**
TIME / DURATION	:	**9.00 AM - 11.30 AM (2 HOURS 30 MINUTES)**
DATE	:	**2 JULY 2025**

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2) sections**; Section A and Section B.
4. Answer **ALL** questions in Section A. For Section B, answer **TWO (2)** questions section B.
5. Please write your answers on the answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.
7. Formula is appended for your reference.

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) Identify the damage compartment and the two (2) possible categories of damaged compartments.

(6 marks)

(b) A box shaped vessel, 150m long, 50m wide and 20m deep floats on an even keel with a draft of 6m in salt water. A transverse watertight bulkhead is fitted 25m from the forward end. If the compartment formed by the bulkhead is open to the sea, estimate the new drafts forward and aft.

(14 marks)

Question 2

a) Describe two (2) variables on which the factor of subdivision of a vessel depended on.

(10 marks)

b) Explain the use of Criterion of Service numeral (C_S) for different ship types.

(5 marks)

c) The values for Cs of Curve (a) is Cargo and curve (b) is passenger. Calculate the Cs values either cargo or passenger, if V=8000 m^3, M=1000 m^3 and P=750 m^3.

(5 marks)

Question 3

a) State the definition by the term below:-

i. Subdivision
ii. Permeability
iii. Margin line
iv. Bulkhead deck

(8 marks)

b) Describe permissible length and floodable length as shown in the Figure 5.0.

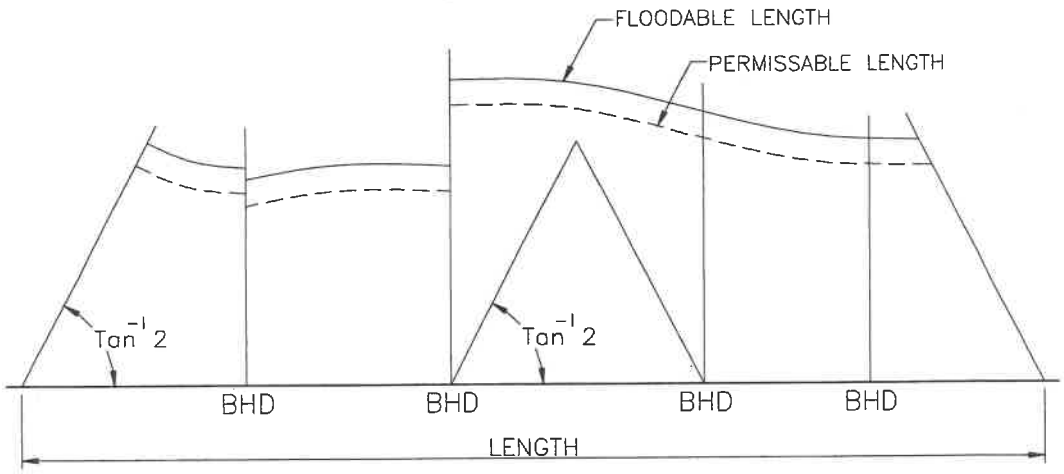

Figure 5.0

(12 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer only TWO (2) questions.
Please use the answer booklet provided.

Question 4

The heeling angle and the corresponding righting levers, GZ for a ship of 14500 tonnes displacement at an assumed KG of 6.15 m are as follows:

Heeling angle, θ	0	15	30	45	60	75	90
GZ, m	0	0.12	0.34	0.58	0.37	- 0.06	- 0.45

In a certain condition of loading the ship displacement is made up as follows:

Item	Mass (t)	KG (m)
Lightship	4060	6.0
Cargo	9040	7.0
Fuel	1200	1.2
Stores	200	8.0

Calculate:

(a) Actual KG (5 marks)

(b) Corrected righting lever, GZ_1 (6 marks)

(c) Plot a graph of corrected GZ_1 versus heeling angle (8 marks)

(d) Range of stability (1 mark)

Question 5

(a) A ship has a draft at the LCF of 8.2m and a trim by the stern of 0.6m. Find the value of the new trim and draft if a mass of 202t was added 31m aft of the LCF. The following information is known:

Δ = 14,508t
TPC = 16.4t/cm
MCT1cm = 17t-m
LCF = at Amidships

(6 marks)

(b) A ship has a load draft of 9.1m. It has drafts of 8.9m forward and 8.5m aft. The only spaces left for cargo are the no.2 hold (LCG 49m forward of amidships) and no.4 hold (LCG 41m aft of amidships). Find the amount of cargo to be loaded into each space so as to complete the loading to an even keel. The following information is known:

Δ = 20,050t
TPC = 20t/cm
MCT1cm = 21t-m
LCF = Amidships

(14 marks)

Question 6

(a) Calculate new GM at the critical instant as given on the following data:

Δ = 4500 t
t = 0.2m by stern
L = 120 m
KM = 7.6 m
KG = 6.1 m
LCF = 2.5 m aft of amidships
MCTC = 50 t-m

(5 marks)

(b) A vessel enters a graving dock with T_F = 5.81m and T_A = 8.25m. The underside of the keel at the aft perpendicular is 0.31 m above the top of the docking blocks. After the water in the dock has been lowered by 1.51m (GM = 0m), the vessel becomes unstable. When the vessels is floating freely, KG = 5.92m. Calculate the drafts forward and aft when this occurs. Given additional data as follows:

Δ = 12,000 tonnes
LBP = 128m
TPC = 20 t/cm
MCTC = 144t.m
F = at amidships
*Assume the hydrostatic particulars remain constant.

(15 Marks)

LIST OF FORMULAE

1. $\delta T = \frac{trim}{LBP}\left[\frac{LBP}{2} \pm LCF\right]$
2. $Change\ in\ trim = \frac{TM}{MCTC}$
3. $Parallel\ rise\ or\ sinkage = w/TPC$
4. $Tan\theta = \frac{Listing\ moment}{\Delta \times GM}$
5. $GG_1 = (w \times d)/\Delta$
6. $Final\ KG = \frac{Final\ moment\ about\ keel}{Final\ displacement}$
7. $TPC = \frac{\rho \times WPA}{100}$
8. $I_L = \frac{2}{3} \times h^3 \times Sum.of\ 2nd\ mmt\ area$
9. $I_L = \frac{BL^3}{12}\ (for\ box\ shaped\ vessel)$
10. $MCTC = \frac{\Delta BM_L}{100L}$
11. $I_T = \frac{2}{9} \times h \times Sum.of\ 2nd\ mmt\ area$
12. $BM_T = \frac{I_T}{\nabla}$
13. $BM_L = \frac{I_{LCF}}{\nabla}$
14. $BM_L = \frac{I_L}{\nabla}\ (for\ rectangular\ box)$
15. $I_{LCF} = I_L - WPA(LCF^2)$
16. $GZ = KN - KGsin\theta$
17. $Corrected\ GZ = GZ + GGsin\theta\ (When\ actual\ KG\ is\ lower\ than\ assumed\ KG)$
18. $Corrected\ GZ = GZ - GGsin\theta\ (When\ actual\ KG\ is\ higher\ than\ assumed\ KG)$
19. $C_s = \frac{72(M+2P)}{V}$

END OF QUESTIONS