UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 2017 SEMESTER

COURSE CODE	: LMB20303
COURSE NAME	: SHIP CONSTRUCTION
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: BACHELOR OF ENGINEERING TECHNOLOGY (HONS) IN MARINE ENGINEERING
DATE	: 05/07/2017 WED
TIME	: 9.00 AM - 12.00 PM
DURATION	: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides.
3. This question paper consists of TWO (2) sections; Section A and Section B. Answer ALL questions in Section A and THREE (3) questions from Section B.
4. Please write yours answers on the answer booklet provided.
5. Write your answers only in BLACK or BLUE ink.
6. Answer all questions in English.

THERE ARE 8 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

Question 1

a) Normally, the aim of shipbuilder is to obtain maximum benefit from their shipyard layout and facilities. The adequacy of shipyard layout directly affects the efficiency of the plant. List four (4) principal factors which affect shipyard layouts and discuss in brief.

(8 marks)

b) 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)

iii) Define an efficiency of a superstructure.

(4 marks)

iv) If the superstructure efficiency of a frigate is 0.75, the upper deck stress for the ship without a superstructure (σ_o) is 180 N/mm^2 and stress when the superstructure is fully effective is 150 N/mm^2, calculate the stress subjected to the upper deck.

(4 marks)

Question 2

a) Refer to figure 1 below. List the components of ship highlighted :

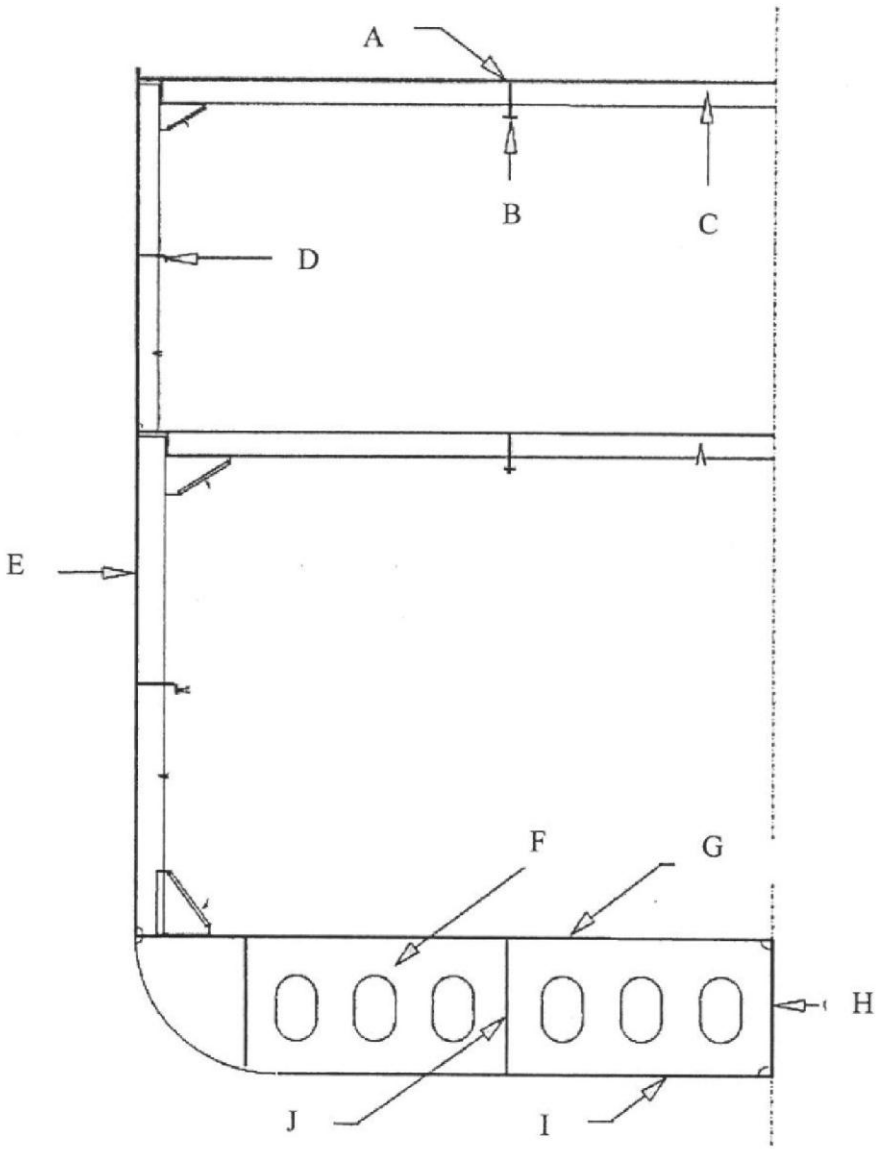


Figure 1

(5 marks)

b) Given in Table 1 is the uncorrected bending moment (BM_{uc}) distribution along the length of a vessel. Calculate:

i. The correction to the BM for all station by fixing end values to zero.

(3 marks)

ii. The corrected BM for all stations.

(3 marks)

iii. The maximum BM

(3 marks)

Station	1	2	3	4	5	6	7	8	9	10	11
$BM_{uc}x10^9$(Nm)	0	10	20	30	35	45	30	25	15	10	5

Table 1

c) The ship in (a) above is 200m in length, its midships second moment of area is 1200 m^4, neutral axis position is 6.5 m from the keel and 7.0 m from the main deck. Calculate the keel and the deck stresses at midships position subjected to the ship.

(6 marks)

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

Question 3

(a) From your understanding on the basic stress and strain in ship structures, explain basic stress and strain and show their relationship mathematically.

(5 marks)

(b) A ship sails through a rough weather at sea is subjected to a bending moment. Derive the general expression of the stress subjected to the structure at a coordinate (x,y) as the ship rolls to Ø degrees.

(5 marks)

(c)

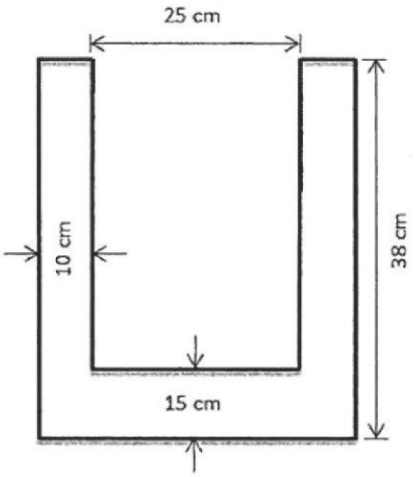


Figure 2

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

(10 Marks)

Question 4

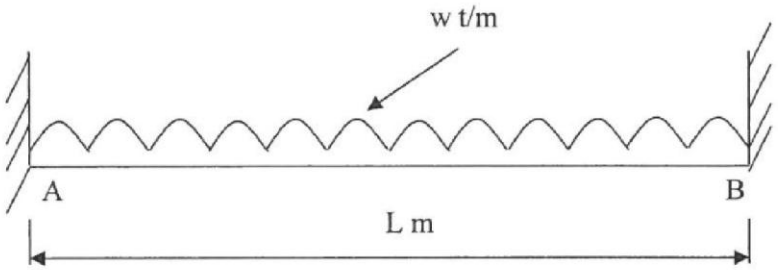
a) In brief, explain what is Keel. Give three (3) types of keel normally used in ship construction?

(5 marks)

b) A combined deck plating and a transverse beam of length L m of grain carrying ship cargo hold designed to carry a uniformly distributed load w t/m can be represented by a structure loaded as shown in Figure 3. Both ends are assumed to be fully welded (i.e fixed ends). Derive the expression of the generalized bending moment of the beam, at a distance x from one end beyond the mid length of the beam, given that the fixing moments at both ends are equal to $wL^2/12$

(10 marks)

Figure 3



c) Calculate the stress subjected to the ship at a coordinate position of 12 m from the ship's centerline and 10 m from the inclined neutral axis on the midships section as the ship rolls to 20 degrees, given that the second moment of areas about the neutral axis (I_{NA}) is 300m^4 and about the ship vertical centerline (I_{CL}) is 250 m^4 and the midships bending moment is 450 MNm.

(5 marks)

Question 5

a) State five (5) design constraints that engineer and designer need to be considered.

(5 marks)

b) The midship section of a vessel breadth 24 m and depth 15 m can be assumed as shown in Figure 4 below. If the vessel is subjected to a maximum bending moment at the neutral axis is 540 MNm, calculate the second moment of area, the position of neutral axis and the stress on the keel and the main deck. All the materials are steel and have a thickness of 15 mm.

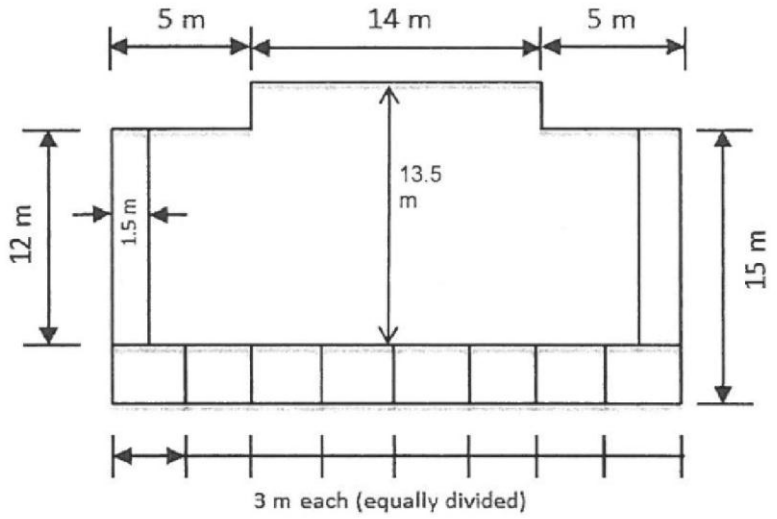


Figure 4

(15 marks)

Question 6

(a) Theorem of Castigliano states that the partial derivative of the total strain energy U with respect to each applied load is equal to the displacement of the structure at the point of application in the direction of the load. The theorem could be applied in solving problems on ship structures.

i. Write down the expression of the strain energy due to bending moment M for a curved beam of second moment area I and the Young's modulus E.

(3 marks)

ii. Derive the equation of the displacement from the expression in (i) above.

(3 marks)

(b) A continuous beam ABC (figure 5) of constant cross section is fixed in position and direction at point A and C, and simply supported at point B. The beam is loaded as shown below:

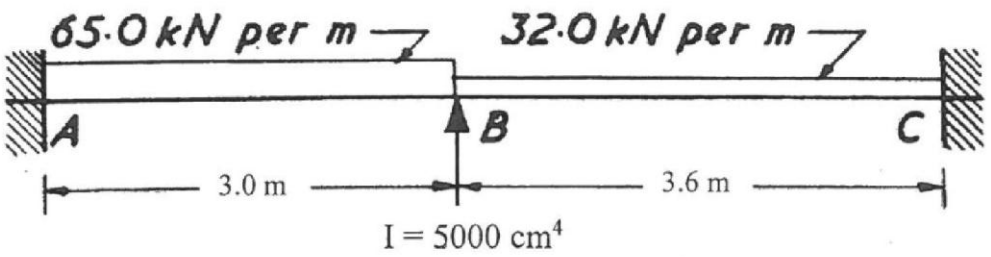


Figure 5

Please analyze and determine the final bending moments at point A, B and C by using Moment Distribution Method and sketch the Bending Moment Diagram to show the distribution of moments along the beam.

(14 marks)

END OF QUESTION