

INDIAN INSTITUTE OF TECHNOLOGY
MID-SPRING SEMESTER, 2011-2012
Department: OCEAN ENGINEERING AND NAVAL ARCHITECTURE

MID-SPRING SEMESTER, 2011-2012
Date: February, 2012 **Time: Two Hours** **Full Marks: 30**
Subject: SHIP STRENGTH (NA21004) **No. of Students: 50 (2nd Year B. Tech)**

Instructions: Answer any ALL questions

$$M_{SW} = -6.63 C_1 L^2 B (C_B + 0.7) \times 10^{-3} \text{ tonf-m for sagging}$$

$$= +1.53 C_1 L^2 B (8.167 - C_B) \times 10^{-1} \text{ tonf-m for hogging}$$

$$M_W = -11.22 C_1 L^2 B (C_B + 0.7) \times 10^{-3} \text{ tonf-m for sagging}$$

$$= +19.37 C_1 L^2 B C_B \times 10^{-3} \text{ tonf-m for hogging}$$

where $C_1 = 10.75 - [(300 - L)/100]^{1.5}$ for $90m \leq L \leq 300m$
 M_{SW} = Still water bending moment and, M_W = Wave bending moment

1. A container carrier length 186.22m, breadth 26.20m, depth 9.65m and draught 7.05m has a block coefficient of 0.65. The vessel is subjected to a hogging bending moment. Calculate the maximum bending moment developed amidships.
2. The lightweight of a ship of length 180m is 135MN with LCG 1.00m aft. of mid-ship. The semi-concentrated items weighing 45MN has a LCG of 1.50m aft of mid-ship. Draw the weight curve of the continuous materials to any suitable scale. Assume parallel middle length of L/3.
3. A continuous beam is shown in Fig.-1. Calculate the support moments using the method of Moment Distribution.

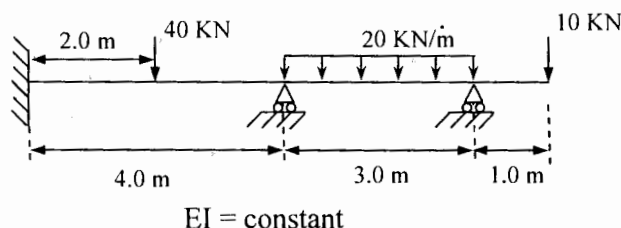


Fig.-1

4. A 18m high bulkhead has a uniform plate thickness of 16mm and is stiffened by vertical stiffeners of uniform cross-section placed at 1000mm spacing. The bulkhead stiffeners are connected at the bottom with brackets. The end fixity of the bottom is 80%. Draw the bending moment curve for the bulkhead stiffener along with the associate plating. Suggest the minimum section modulus if the permissible stress is $140N/mm^2$.
5. a) Why a Trochoidal wave profile is considered for the longitudinal strength calculation ?
b) In a calculation of the longitudinal strength for the sagging condition, the following mean ordinates in tonnes per metre were found for sections of a ship starting from aft.:

Section:	0	1	2	3	4	5	6	7	8	9	10
Weight:	22.0	47.1	84.4	147.3	235.6	253.3	239.6	174.5	87.6	44.9	30.0
Buoyancy:	34.4	130.3	171.6	176.3	143.4	108.6	102.1	121.6	143.0	147.0	89.8

Draw the shearing force and bending moment diagrams and state the positions of values of the maxima.