MEMORIAL UNIVERSITY Faculty of Engineering and Applied Science

Engineering 5003 - Ship Structures I

MID-TERM EXAMINATION

Date: Friday Feb. 10, 2017 **Professor: Dr. C. Daley**
Time: 10:00 - 10:50 am

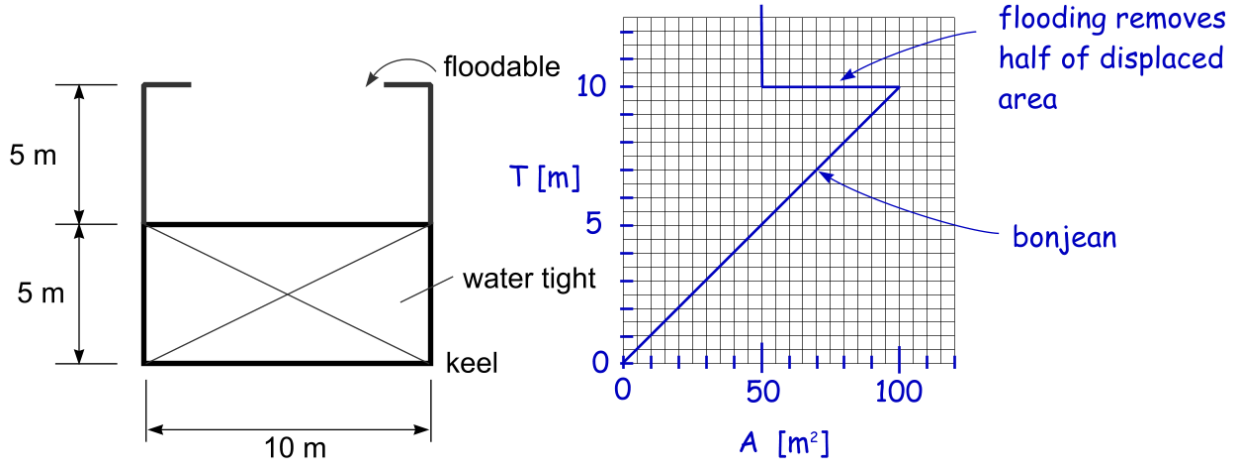
Answer all questions. Total 20 marks. Each question is worth marks indicated **[x].**
Short, clear answers are best. If you are having a problem (ie a road block) assume something, write down the assumption, and continue. Use the page backs for extra space if needed.
Good luck.

NAME: _____

NUMBER: _____

SOLUTiONS

1. For the section shown below (left), sketch the corresponding bonjean curve (with values up to a depth of 12 m). **[4]**



2. A triangular block of wood is floating water as shown below.

a) what is the draft T of the block? Is the draft constant? **[2]**

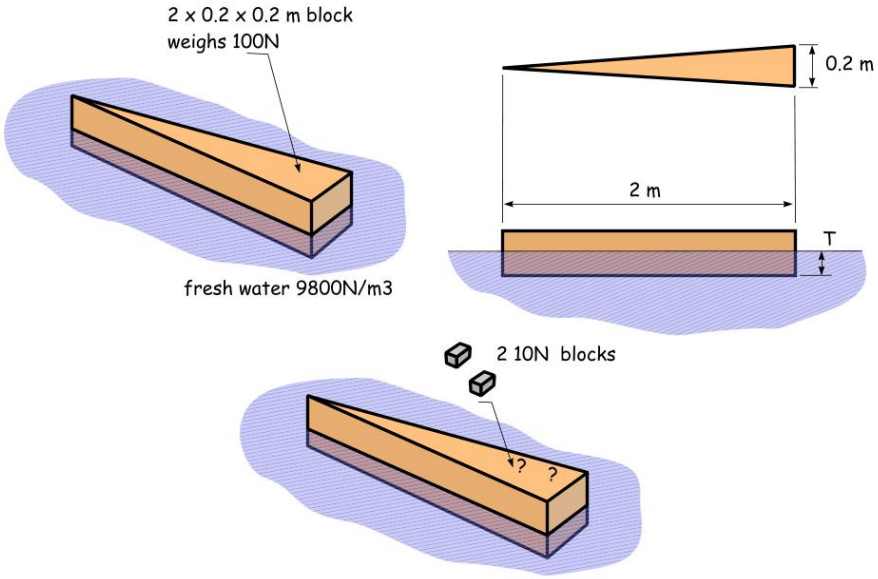
2 x 0.2/2 x T x 9800 = 100 N

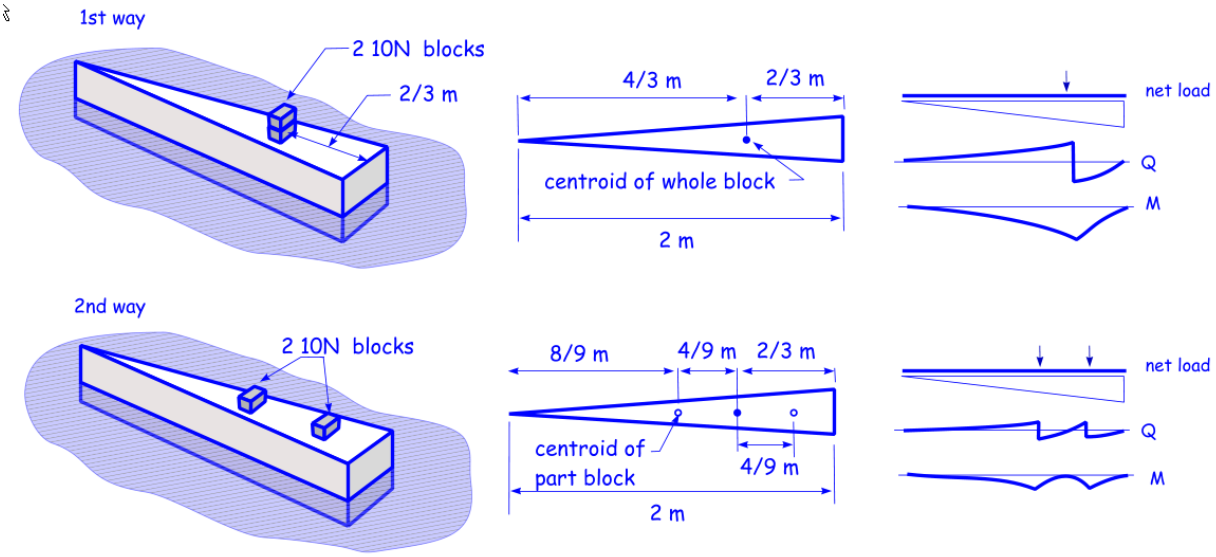
T = 100/(9800 x 0.2) = 0.051 m

The draft is 5.1 cm and is constant (all weight is even over the shape as is buoyancy).

b) you have two small 10 N steel blocks. Describe two different ways to place these 10N blocks which won't cause any pitch or roll of the wood block? (i.e. block sinks evenly) **[2]**

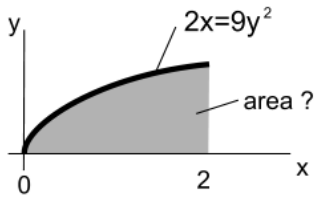
c) Which of the two ways will cause the lesser bending stress **[2]**



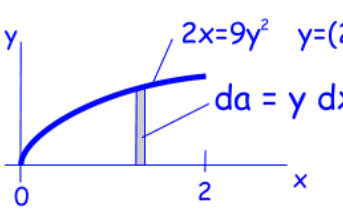


the two small blocks must have their combined center of gravity at the same point as the triangular block (so no moment occurs to cause trim). The two blocks can be moved equally left and right. Likely mimimum bending will occur when blocks are over the centroids of the left and right parts of the triangular block.
So second way causes less bending.

3. Find the area indicated **[4]**

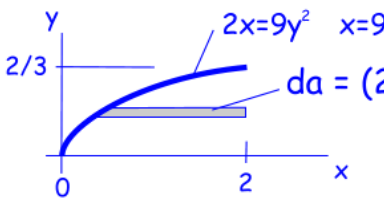


either integrate in x or y:



$$A = \int_0^2 2/9^{1/2}\, x^{1/2}\, dx$$

$$= 2/9^{1/2}\, \frac{x^{3/2}}{3/2}\Big]_0^2 = 0.8888$$



$$A = \int_0^{2/3} 2\text{-}9/2\, y^2\, dy$$

$$= 2y - 9/2\frac{y^3}{3}\Big]_0^{2/3} = 0.8888$$

4. For the four beams shown below;

Sketch the shape of the shear force and bending moment diagrams. **[6]**
Assume the load is centered and ¼ of the beam length. No numbers are required, but you should estimate the shape as correctly as you can.