

# Innovative Ship Design

## - Midterm Exam -

*April 7<sup>th</sup>, 2012*

**Part I. Determination of Principle Dimensions, 13:00-13:50 (50 minutes)**

**Part II. Propeller and Main Engine Selection, 13:50-14:40 (50 minutes)**

**Part III. Freeboard Calculation, 14:40-15:30 (50 minutes)**

**Part IV. Mixed Problems, 15:30-16:00 (30 minutes)**

<b>Name</b>	
<b>SNU ID #</b>	

**Note:** Budget your time wisely. Some parts of this exam could take you much longer than others. Move on if you are stuck and return to the problem later.

Problem Number		Problem 1							Total
		1	2	3	4	5	6	7	
Grader	Max	10	10	10	10	15	15	30	100
	Score								

## Determination of principle dimensions of a container carrier

Determine the principle dimensions of a container carrier ("design ship") by adding one row to the basis ship described in reference data (table 1).

Question (1)

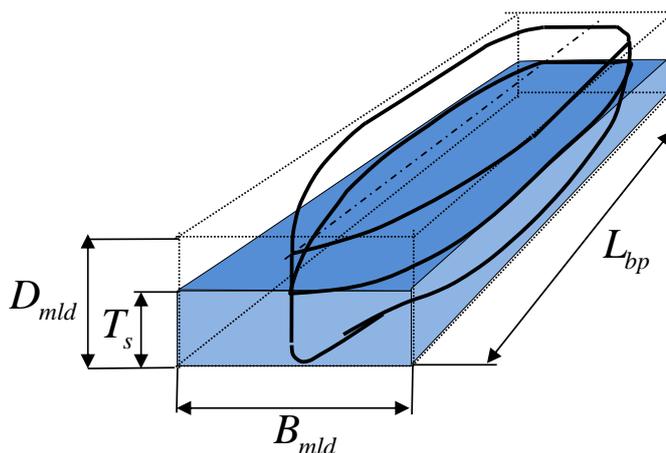
**Determination of the breadth of design ship**

When we increase the breadth of the basis ship by expanding one row, what is the breadth of design ship? [10 Points]

Question (2)

**Write down the buoyant force acting on the ship by using the principle dimensions such as length  $L_{bp}$ , breadth  $B_{mld}$ , scantling draft  $T_s$  and block coefficient  $C_{b,s}$ .** [10 Points]

(sea water density:  $\rho$ ; gravitational acceleration:  $g$ )



Question (3)

**(Static equilibrium) For a ship to float in sea water, there is a physical constraint to be satisfied.**

**Explain and formulate the physical constraint referring to Newton's second law.** [10 Points]

Question (4)

**(Weight) The deadweight and lightweight of the design ship at  $T_s$  have to be estimated. For the estimation of the lightweight, we assume that the lightweight is composed of structural weight, outfit weight, and machinery weight. Explain how can we estimate the weight of each component by using the principle dimensions.** [10 Points]

Question(5)

NMCR will be estimated during the propeller design. However, NMCR at conceptual design stage can be estimated by using Admiralty formula. Explain how to estimate NMCR. [15 Points]

Question(6)

Determine the number of 14[mt] containers, which can be loaded on the design ship at scantling and design draft, respectively. [15 Points]