Innovative Ship Design

- Midterm Exam -

April 7th, 2012

Part I. Determination of Main 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)

Name	
SNU ID #	

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		1					Total
		1.1	1.2	1.3	1.4	1.5	
Grader	Max	15	10	25	25	25	100
	Score						

Determination of Propeller Main Dimension & Selection of Main Engine

Assumption :

- **The expanded area ratio (Ae/Ao) and the number of blades (z) of the design propeller are the same as those of the basis propeller.**

[1] Governing Equation and Objective Function

Derive two governing equations (equality constraint) and objective functions for this problem.

And **explain** the meaning of each equation.

[2] Assume the **initial value of a propeller diameter** of the design ship.

[3]

Given	D_P [m], A_E/A_O, z ; v [m/s]; $R_T(v)$ [kN]
Find	P_i [m] ; P [kW] , n [1/s]

Determine the propeller pitch (Pi), delivered horse power (DHP), and engine speed (n) at the service speed of the design ship, when the

Determine the **propeller design point** of the design ship. And **check** whether the **main engine** of the basis ship can be used for the design ship or not. If the diesel engine of the basis ship is not proper for the design ship, select another main engine.

- service speed of the design ship : $V=24$ *knots*

[4]

Given	z ; $P_{NCR}[kW]$, n_{MCR} [1/s] ; $R_T(v)$ [kN]
Find	D_p [m] , P_i [m], v [m/s]

Determine the diameter (Dp), pitch (Pi), and ship speed(v).

[5] By using the result of the problem 4 (main dimensions of propeller), calculate the engine speed (n), required power (P) at three ship speeds, 23.0, 24.0, and 25.0 *Knots*.

Draw the speed-power curve of the design ship. And **select the main engine** for the design ship.