College of Maritime Engineering and Marine Sciences

Ship Structures II

First Evaluation **July 1st 2019**

Student: ……………………………………………………………

First part – theoretical concepts

1.- With lines, join items from left column with those on the right one, (5).

Selection of stiffener spacing		Solid mechanics
Structural detail design		Rule-based design
Structural analysis		Sizing of brackets
Rational design		Stress levels

2.- Mention one advantage of the Rule-based design of ship structure compared to Rational design, (5):

…………………………………………………………………………...…………………………….

……………………………………………………………………………….…………………………...

3.- Mention one disadvantage of the Rule-based design of ship structure compared to Rational design (5):

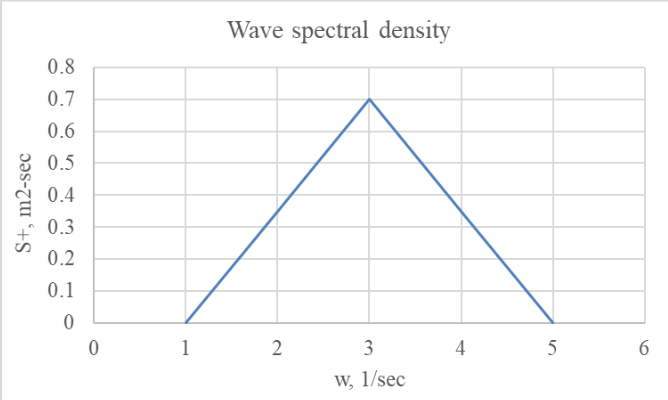
…………………………………………………………………………...…………………………….

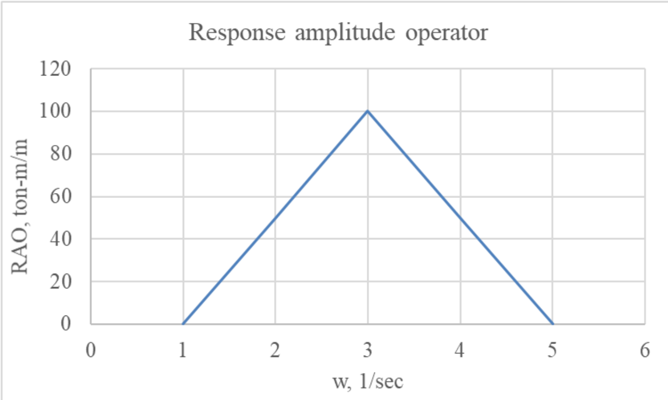
……………………………………………………………………………….…………………………...

4.- Because of weight and reactions at 3 bearings separated 1.5 meters between them, at a certain cross section of a shafting system, a bending moment of 1200 N-m results. The maximum normal stress cannot exceed 140 N/mm^2. The nominal diameter of the shaft is a random variable with Normal distribution, $N(\overline{D} = 4.25cm;\ \sigma_D = 0.05cm)$. What is an equivalent proposition to calculate the probability of failure, (10)?

a. *P[D'<3.73]*	b. *P[D'<2.73]*	c. *P[D>4.25cm]*	d. *P[D'>2.73]*

5.- For a tanker ship (L: 109 m, B: 16.5 m, D: 8.3 m, DWT: 6500 ton, Δ: 9600 ton, T: 6.75 m), the midship bending moment has a response amplitude operator showed in the figure on the right; also for a certain sea state, a simplified spectral density function is estimated, see figure on the left. What is the *RMS* value of the random variable bending moment, (10)?





a. $\sigma_{BM} = 98.3\ m$	b. $\sigma_{BM} = 118\ ton-m$	c. $\sigma_{BM} = 1183\ m$	d. $\sigma_{BM} = 503\ ton-m$

6.- The total pressure on the bottom of a tanker ship (L: 109 m, B: 16.5 m, D: 8.3 m, DWT: 6500 ton, Δ : 9600 ton, T: 6.75 m) is calculated as 80.9 kN/m^2. What is the value for the dynamic part of that value, (10)?

a. p_{dyn} = 13.1 N/mm^2	b. p_{dyn} = 13.1 kN/m^2	c. p_{dyn} = 131 N/mm^2	d. p_{dyn} = 235 N/mm^2

I certify that during this exam I have complied with code of ethics of our university. ………………………………………………………

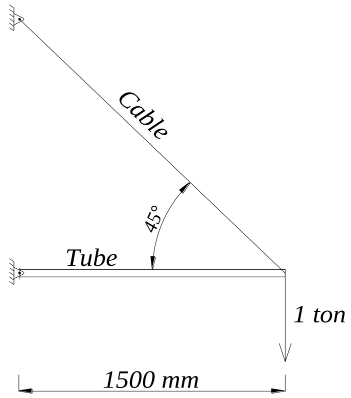
College of Maritime Engineering and Marine Sciences

Ship Structures II

First Evaluation **July 1st 2019**

Student: ……………………………………………………………

1.- The following frame is composed by a steel cable, 9 mm in diameter, and, a tube (D_o: 50 mm, D_i: 44 mm), and it is designed to lift a weight of 1 ton. The tube is horizontal, while the cable is connected to a pin, and forms an angle of 45 degrees with the horizontal. You are asked to analyze this frame to determine how structurally safe it is, (15).

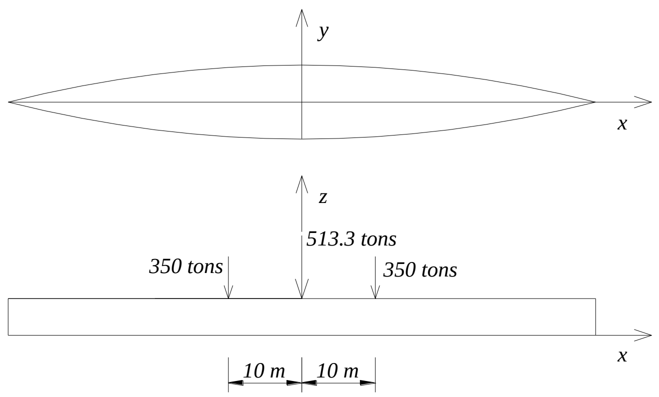


2.- A simplified ship (L: 80 m, B: 10 m) with parabolic waterplane and vertical sides is to be quasi-statically analyzed while it sail in waves: $B(x) = B\left(1-(2x/L)^2\right), [m] \quad -40m < x < 40m$

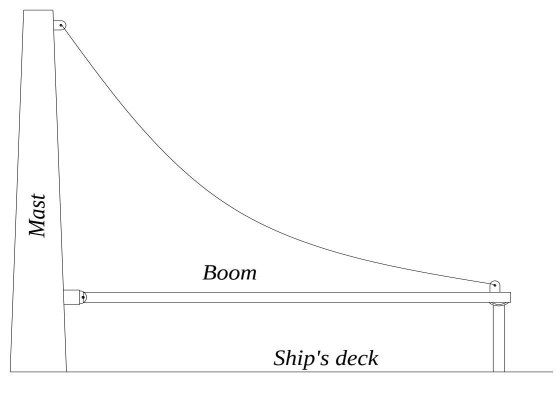
Its hull weight distribution is simplified as: $w(x) = -0.005x^2 + 8.5, ton/m, \; -40m < x < 40m$

Consider that the cargo and machinery are represented by three concentrated forces, and are located as shown in the attached figure.

Calculate the maximum shear force when a simple wave sinusoidal wave of 3.0 m height acts on the ship hull, (25).



3.- Consider a boom resting on simple supports on the deck of a fishing vessel which operates at 13 knots in a sea state with significative height of 1.23 m. This element is built from steel tube: D_o: 20 cm and 4 mm in thickness, and, it is 8 m long. When the ship oscillates in waves a heave acceleration of $0.30g$ is developed. Calculate the maximum deflection that the boom supports due to the inertial load, (15).



jrml/2019

I certify that during this exam I have complied with code of ethics of our university.

………………………………………………………