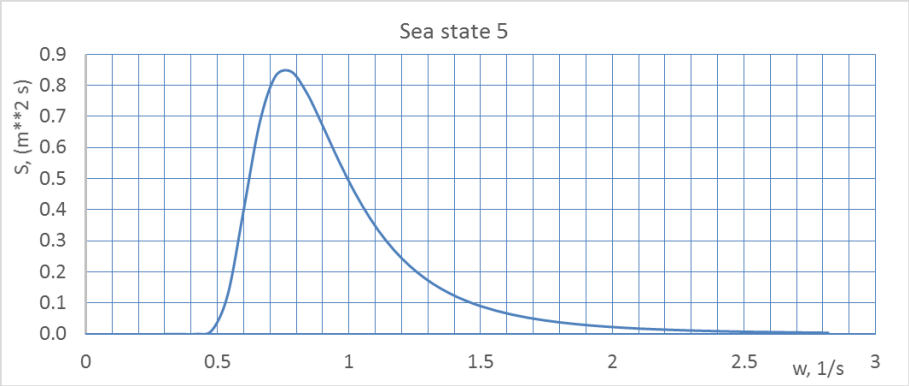
College of Maritime Engineering, and Biological, Oceanical and Natural Resource Sciences

Ship Structures II

First Evaluation **June 2016**

Student: .....

1.- For a sea state 5 (*Strong breeze*), using Brettschneider formulation its Spectral density is depicted in the following graph: $H_{1/3}$: 8.8 ft and T_{max}: 8.3 sec. Make an estimation of the amplitud of the maximum harmonic component, and, its wave length. What is the probability that you find a wave with height larger than 5 meters? (20)



Rayleigh probability density function: $f(r)=\frac{r}{\sigma_R^2}e^{-1/2(r/\sigma_R)^2}$.

2.- Fatigue.-

i.- Describe the S-N curve of a material (half page). (7)

ii.- Explain the origin of Palmgren-Miner rule (half page). (8)

3.- Hull beam loads.- The following tables (see next page) present the sectional areas and segment weights along the length of a tanker ship, statically in equilibrium in a sinusoidal wave.

i. Estimate the Max/min Shear force on the hull (25)

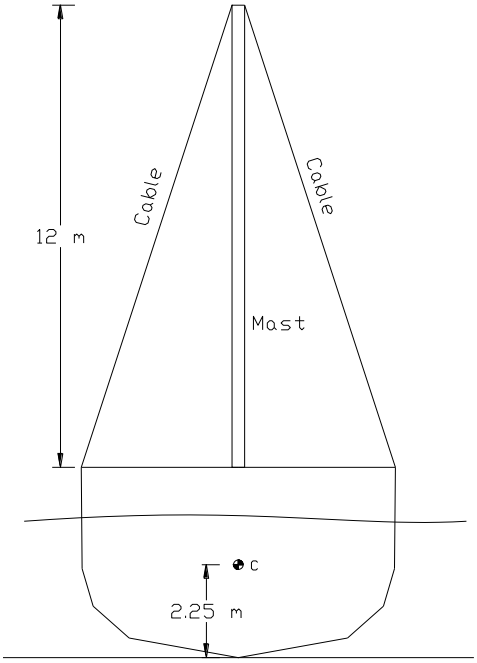
ii. Clearly specify whether it is maximum or minimum, according to DNV sign convention. (5)

4.- Inertial load.- You are asked to select cables to sustain a 12 meter height mast, built with an steel tube (D_{ext}: 40 cm, D_{int}: 38 cm). This element is welded to the deck of a ship, L: 40 m, B: 8 m. D: 4.25 m, and T: 3.75 m, as shown in the figure. Considering **only inertial loads**, calculate the diameter you would recommend for those cables. The following parameters were determined for the ship: Displacement: 613.2 tons, GM: 0.65 m, roll period: 8.00 sec, roll motion amplitude: 40º, position of axis of rotation: 2.25 m above BL, and, roll gyration radius: 3.63 m. (35)

Start by explaining what is the process that you will follow to do your calculations: model, how to estimate loads, etc.

Position from FP, m	Sect. Area, m**2
-3.741	0
-2.806	2.553
-1.87	5.779
-0.935	9.043
0	12.722
2.8	28.134
5.6	44.682
7.14	54.781
8.679	65.071
8.68	65.071
8.681	65.071
9.94	72.75
11.2	79.944
16.8	103.133
22.4	110.985
33.6	107.014
44.8	103.432
61.6	104.131
78.4	107.444
81.2	104.446
84	101.096
85.999	97.729
87.998	93.096
87.998	93.096
87.999	93.097
88.592	91.767
89.196	90.441
89.197	90.441
89.197	90.442
92.098	82.949
95.2	73.958
100.8	52.587
106.4	27.029
107.8	19.703
109.194	13.569
109.2	13.569
109.206	9.668
112	5.001
114.996	2.093
115.5	1.029
115.758	0

Position from FP,m	Segment Weight, t
-3.9	
-3.1	6.08
-2.5	5.35
-1.6	10.03
-0.9	8.97
0.05	13.81
2.9	55.71
4.9	38.98
4.94	2.45
6.9	143.89
9.25	132.15
12.6	66.98
14.18	175.42
25.37	1245.15
30.53	593.84
41.2	1229.06
56.76	1761.62
72.4	1769.56
74.77	255.32
88	1433.95
89.26	32.17
90.48	39.33
90.96	15.92
95.93	244.28
97.6	80.49
101.38	161.24
106.83	223.45
109.56	90.35
110.57	27.7
111.76	35.27
112.28	17.92
113.57	44.46
115.9	53.21



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

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