In this assignment you will need to evaluate and assess a wave energy application.

Task 1

Estimate the wave energy for regular and irregular waves using the JONSWAP empirical formulation for a fetch with length the summation in meters of your Student IDs, and a wind speed of 30 m/s (for JONSWAP a = 0.0016 & b =0.2857). Estimate the significant wave height and peak wave period. Estimate:

i. Significant wave height
ii. Peak wave period
iii. Wave energy flux regular
iv. Wave energy flux irregular waves

Provide all the step for the calculation with and ensure the results are in the correct SI units.

Task 2

With the provided wave data timeseries of significant wave height (Hm0) and peak wave period (Tp), estimate the Pwave of irregular waves, and subsequently estimate (for all quantities, Hm0,Tp, Pwave):

i. Mean value
ii. Standard deviation
iii. Maximum value
iv. Minimum value

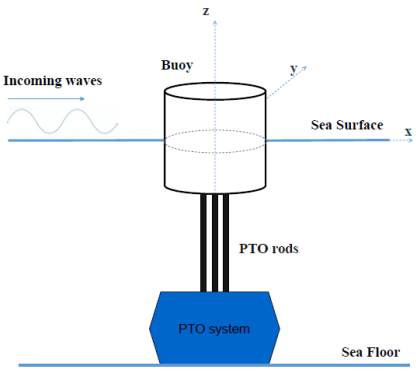
Task 3

Using the wave data timeseries and the provided power matrix of a wave energy converter, estimate the power produced and capacity factor. Furthermore, provide the

i. probability of occurrence matrix (bivariate distribution)
ii. corresponding power production per Sea State matrix

Task 4

Using the mean value of Hm0 you found in Task 2, estimate the displacement amplitude and mean power (in Watts) for a cylindrical wave energy converter, with Power-Take-Off damping value of 300,000 Ns/m and mass equal to the summation of you netID expressed in Kg.



You will need to calculate the variables from increasing wave period 4-20 seconds, the basic parameters needed to calculate the displacement amplitudes and mean power are also provided in Table 1, please note that you will also need as intermediate step to also estimate the viscous damping for each period.

Wave period (s)	Excitation force coefficient (N/m)	Radiation damping (Ns/m)	Added mass (kg)	hydrostatic stiffness coefficient (N/m)
20.00	705,314	8,016	294,449	770,476
19.00	690,200	10,561	292,754	770,476
18.00	670,931	13,931	290,446	770,476
17.00	669,490	14,186	290,272	770,476
16.00	657,556	16,285	289,586	770,476
15.00	656,066	16,556	289,244	770,476
14.00	640,732	19,341	286,085	770,476
13.00	622,822	22,505	283,906	770,476
12.00	599,482	26,653	278,536	770,476
11.00	571,441	31,353	273,239	770,476
10.00	537,292	36,679	265,617	770,476
9.00	493,379	42,586	255,355	770,476
8.00	440,116	47,882	243,591	770,476
7.00	370,708	51,178	229,379	770,476
6.00	287,473	48,769	215,654	770,476
5.00	191,111	36,888	207,322	770,476
4.00	92,835	16,795	210,452	770,476