Department: Civil Engineering Level: 5 Semester: Second semester Subject: Inland Navigation and Harbour Engineering Code: CIE 506	Ministry of Higher Education Higher Institute for Eng. and Tech. New Damietta	Mid-Term Exam Time allowed: 1.0 hr Page numbers: 1 Date 01/04/2023 Total Degree: 20 degrees

Answer all questions and assume any missing data.

QUESTION 1 (6 degrees):

a) Choose the correct answer

1. If the water depth at point A , d= 60.00 m , wave height H= 3.5 m ,wave period T= 8 sec. and Kr= 1.00, wave height at point B with water depth d = 10.00 m , Kr = 0.75 will be ..... (2.33 m - 2.44 m – 2.60 m)

2. Coastal Structures are subjected to the effects of .....
(Wind – Waves – Tidal current – Coastal sediment – All Previous Forces)

3. If wind speed= 20 knots, duration = 12 hrs and F = 100 N.M.
So the average wave height is .....
(6.20 ft – 7.0 ft - 8.5 ft)

b) Show by sketch the difference between :

- Seawall, Breakwater.
- Diffraction, Refraction along irregular shore line
- Spring Tide, Neap Tide.

Question (2)(10marks)

a) Plot a wind rose using bar method only

For the Given number of hours occurrence for the wind for year 2022 at Damietta

Wind speed (knots)	N	E.	S	W
1-10	1200	800	600	1100
11-20	800	600	300	700
21-30	600	400	700	300

b) If fetch Length = 200 N.M. and wind speed = 20 Knots.

1. It is required to calculate the wave length L , wave height H, celerity C .

2. Find wave height at point A having Polar Coordinates (150 , 60°) from tip of single breakwater, if waves strike the single breakwater at angle 180° , and water depth of the tip d=15.0 and Kr= 0.70

Question (3) (4 marks)

a- Calculate H_{sig}, $H_{r.m.s.}$, H_{avg} and H_{max} if :

Wave Height (m)	3.5	5.5	4.0	4.5	6.5	5.0
No. of Waves	10	35	0	25	42	12

With my best wishes
Prof.Dr.Osami Rageh

Model Answer

QUESTION 1 (6 degrees):

a) **<u>Choose the correct answer</u>**

1. **If the water depth at point A, d= 60.00 m, wave height H= 3.5 m, wave period T= 8 sec. and Kr= 1.00, wave height at point B with water depth d = 10.00 m, Kr = 0.75 will be ……..**

(2.33 m – **<u>2.44 m</u>** – 2.60 m)

2. **Coastal structures are subjected to the effects of ……..**

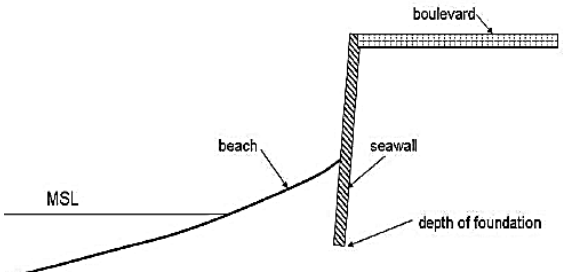
(Wind – Waves – Tidal currents – Coastal sediment – **<u>All Previous forces</u>**)

3. **If wind speed= 20 knots, duration = 12 hrs and F = 100 N.M. So the average wave height is …….**

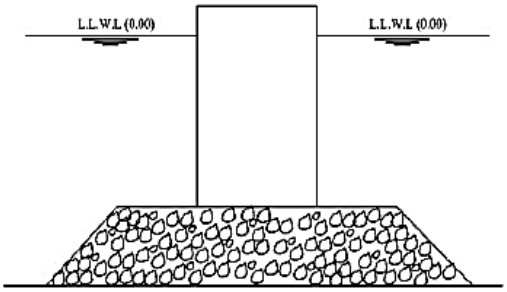
(**<u>6.20 ft</u>** – 7.0 ft - 8.5 ft)

a) **Show by sketch the difference between:**

- **Seawall, Breakwater.**

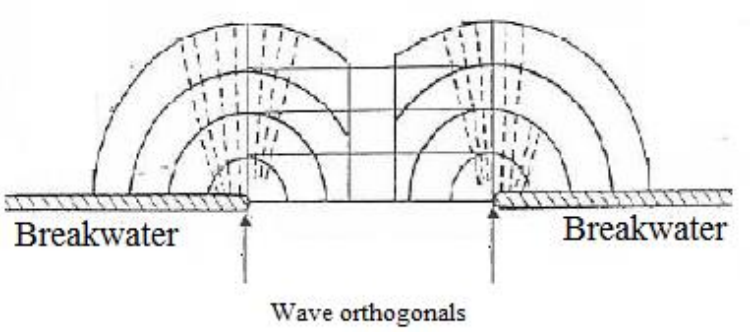


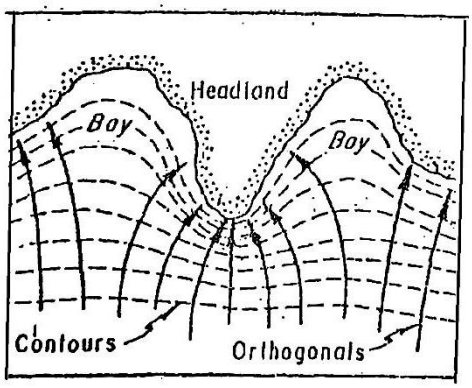
Seawall



Breakwater

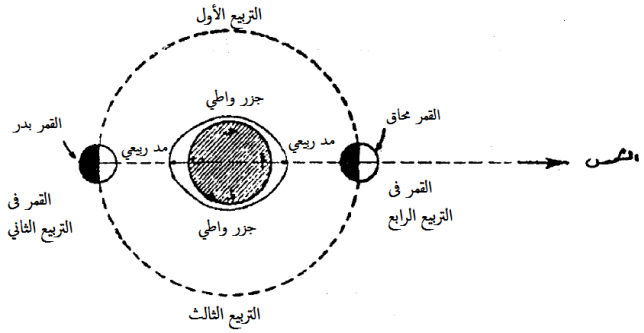
- **Diffraction, Refraction along irregular shore line**



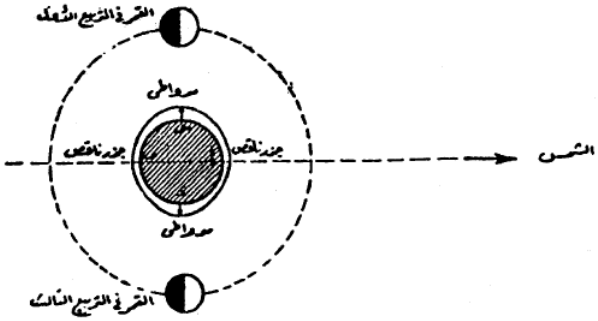


Refraction along irregular shore line

- **Spring Tide, Neap Tide.**



Spring Tide



Neap Tide

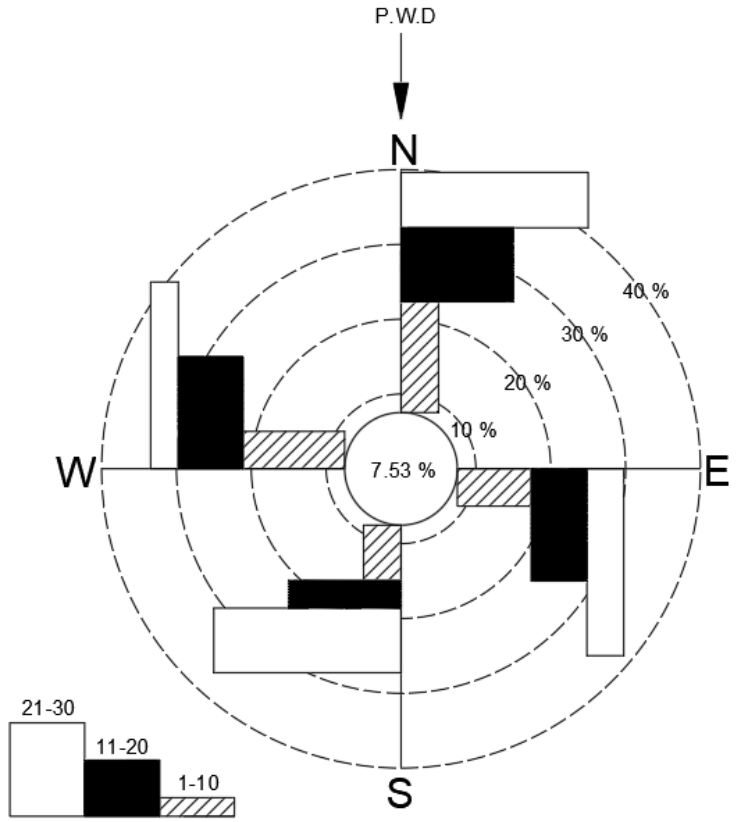
QUESTION 2 (10 degrees) :

a) Plot a wind rose using bar method only ….

Total Recorded Hours = 2600 + 1800 + 1600 + 2100 = 8100 hrs.
Total unrecorded hours = 8760 – 8100 = 660 hrs.

Ratio of unrecorded hours $= \frac{660}{8760} \times 100 = 7.53\ \%$

	N	E	S	W
1 – 10	14.81	9.88	7.41	13.58
11 – 20	9.88	7.41	3.70	8.64
21 - 30	7.41	4.94	8.64	3.70



b) If the fetch Length = 200 N.M. and wind speed = 20 Knots.

1. It is required to calculate the wave length L, wave height H, celerity C.

Solution

$H_s = H_0 = 7.9 \text{ ft.} \times 0.3048 = 2.41 \text{ m}$ $\quad t = 8.0 \text{ Sec.}$ (Fetch limited)

$$L_0 = 1.56\ T^2 = 1.56 \times 8.0^2 = 99.84\ m$$

$$H_0 = 2.41\ m$$

$$C_0 = 1.56\ T = 1.56 \times 8.0 = 12.48\ m$$

2. Find wave height at point A having Polar Coordinates (150, 60^0) from tip of single breakwater, if waves strike the single breakwater at angle 180^0, and water depth of the tip d = 15.0 and K_r = 0.70

Solution

$$L_0 = 1.56\ T^2 = 1.56 \times 8.0^2 = 99.84\ m$$

$\frac{d}{L_0} = \frac{15}{99.84} = 0.15$ $\quad From\ table\ get$ $\quad \frac{d}{L} = 0.1833$ $\quad K_s = 0.9138$

$$\therefore H_{tip} = H_0 . K_r . K_s = 2.41 \times 0.7 \times 0.9138 = 1.54 \text{ m}$$

$\frac{d}{L} = \frac{15}{L} = 0.1833$ $\quad L = 81.83 \text{ m}$ $\quad \frac{r}{L} = \frac{150}{81.83} = 1.83$

From Chart where, $\theta = 180^0$ $\quad \beta = 60^0$ $\quad \frac{r}{L} = 1.83$ $\quad \therefore K_D = 0.15$

$$\therefore H_A = H_{tip} . K_D = 1.54 \times 0.15 = 0.231 \text{ m}$$

QUESTION 3 (4 degrees) :

a) Calculate H_{sig} , $H_{r.m.s.}$, H_{avg}, H_{max} if :

Wave Height (m)	6.5	5.5	5.0	4.5	3.5
No. of Waves	42	35	12	25	10

$$H_{sig} = \frac{6.5 + 5.5}{2} = 6.00 \text{ m}$$

$$H_{r.m.s} = \frac{1}{\sqrt{2}} H_{sig.} = \frac{1}{\sqrt{2}} \times 6.00 = 4.24 \text{ m}$$

$$H_{av.} = 0.886\ H_{sig} = 0.886 \times 6.00 = 5.32 \text{ m}$$

$$H_{max} = 1.87\ H_{sig} = 1.87 \times 6.00 = 11.22 \text{ m}$$