Mansoura University
Faculty of Engineering
Irrig. & Hydr. Engr. Deprt.
Year/Level: 4th year- 2nd Semester

Course: Harbour Engineering
Code: IRH8324
Time: 3 Hrs.
Date: 16.06.2013

- A "RESTRICTED OPEN BOOK" examination. (Total 4 pages).
- The candidate may bring to the examination and use, Lecture notes PAERT II and CHARTS, with restriction "no other printed materials or written notes".
- Don't use the red colour in your answer.
- Any Missing Data can be reasonably assumed.
- Answers should be given with net and clear sketches.

مع أمنياتي القلبية بالتوفيق والنجاح وألف مبروك مقدماً للجميع علي درجة البكالوريوس في الهندسة المدنية

QUESTION 1: (15 degree)

[ILOs: A3, A11, A13, B1, B3, B6, C2, C7]

1.1. Complete the Following:

1. Harbours main facilities includes ……,……,……,…… .
2. Studying of currents are important to ……,……,……
3. Fetch is defined as ……
4. Types of progressive waves are ……,……,……
5. Determination of prevailing wind direction is important in ……,……
6. Significant wave height is the average of ……
7. Types of wave breaking are ……,……,……
8. Water waves are classified according to water depth to ……,……,……
9. Pier berth is …… While wharf berth is …… ……
10. Mean tidal range is the difference between …… and ……

1.2. Discuss with net sketches waves transformation/ propagation to shoreline with and without existing of obstructions?

1.3. Waves with H = 5.00m and T = 8 seconds strike upon a single breakwater at angle of 75°. Calculate wave height at a point A behind the breakwater that having a polar coordinates R = 800 m, θ = 75°.

QUESTION 2: (60 degree)

[ILOs: A3, A13, A14, B1, B3, B6, B9, B13, C2, C5, C7, D2, D6, D8]

To meet growing demands of the domestic economy, an urgent need to develop existed Egypt's ports as well to suggest new ports on both eastern and northen coast of Egypt came about. So, figure (1) represents suggested new port on the north coast of Egypt to serve the volume trade in table (1).

Given:

Ho = 4.00 m, T = 5sec., TR = 2.00 m, Kr = 0.90, MSL = (0.00)
Width of waterway can be taken as **5 B_{max}**,
Expected vertical movement = **4.00m**
Predicted **soft** sedimentation + Sounding error + Dredging error = **1.00 m**

Table (1): Volume of trade passing through the suggested new port.

Cargo	Sizes [m]	No. of Berths	Storage factor	Annual Amount [10^6 tons]	DWT
Containers	$\frac{300 \times 40}{14}$	3	---	16	60000
G. Cargo	$\frac{250 \times 30}{10}$	2	1.20	14	20000
International passenger	$\frac{300 \times 50}{12}$	1	----	---	---
National passenger	$\frac{100 \times 20}{6}$	2	----	----	---

Requirements:

2.1. Determine following dimensions for the given general layout: waterway width and depth, turning basin radius and depth, length of container wharf, length of passenger wharf, width and length of General Cargo basin berth.
2.2. Calculate all bottom levels (A, B, C, D, E and F).
2.3. Calculate the required storage area for the general cargo transit shed (mechanical storage) then assume its length and width.
2.4. Draw a net sketch for the given master plan writing all calculated dimensions, lengths, levels and areas which were calculated in the above questions.

2.5. Design and draw clear and net sketch of a suitable trunk cross section for the rubble mound main breakwater at **water depth equal to 12 m** – Calculate required weights, thickness, main dimensions and levels (**BW is free of being overtopping, BW sea side slope = 2 : 1, and BW harbour side slope = 1.5 : 1, γ natural stone = 2.20 t / m^3, γ artificial stone = 2.40 t / m^3**).

2.6. For the suggested block type berth for general cargo [see figure 2], it is required to check the stability against sliding and overturning, and to check stresses on the first layer, last layer and on the soil (for unsafe conditions, suggest the required modification and do not recalculate), given: **(γ concrete = 2.50 t / m^3, allowable stress on concrete = 30 kg / cm^2, allowable stress on rubble foundation = 4 kg / cm^2, and soil bearing capacity = 1.50 kg / cm^2)**

2.7. If decision makers would to use a part of the main breakwater at **water depth 20 m** as a berth for Tankers **(draft = 15 m)**, **(a)** suggest the dimensions of a **composite vertical caisson breakwater Berth**, **(b)** calculate the wave pressure using Sainflou method, and **(c)** determine the necessary weight of the rubble mound foundation.

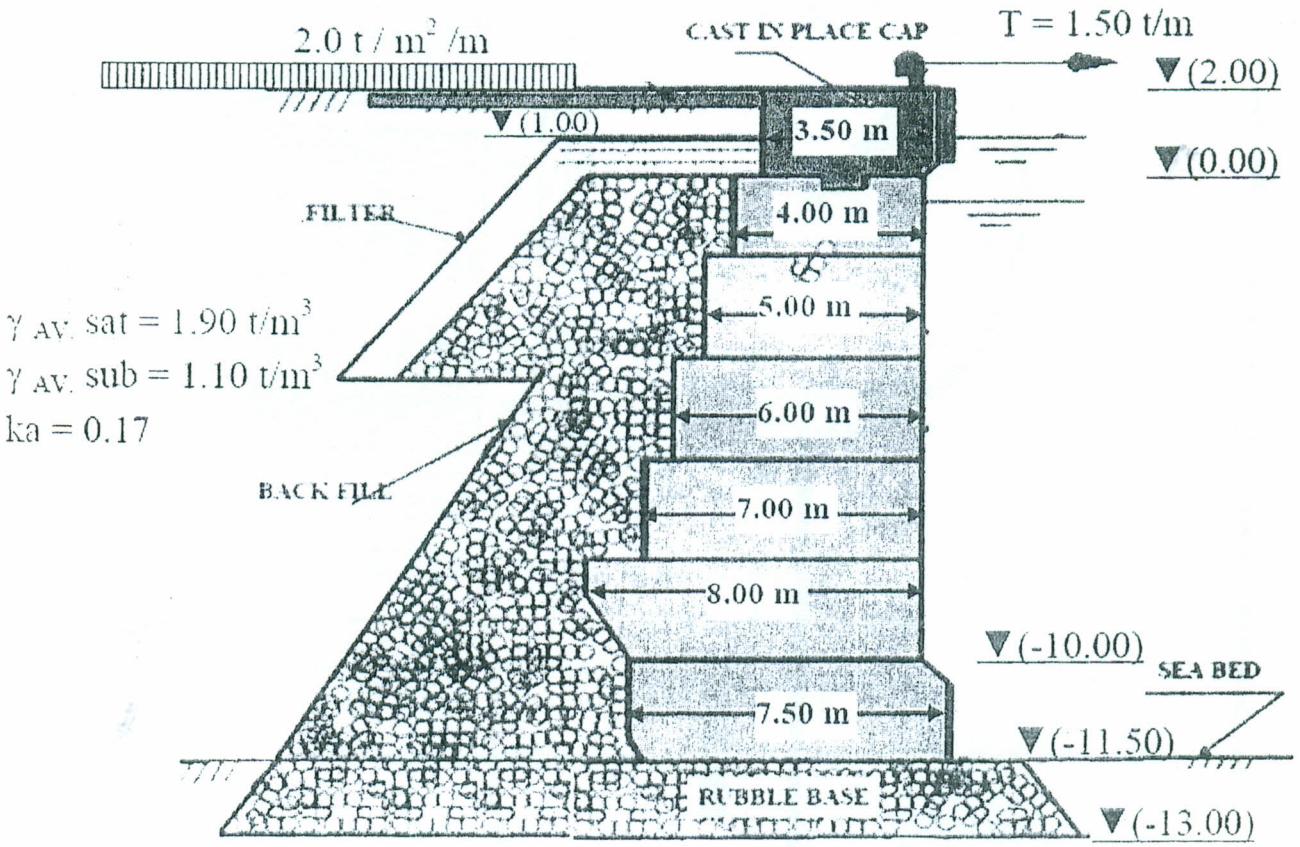

Figure (2): Suggested Block Type Berth for General Cargo Basin

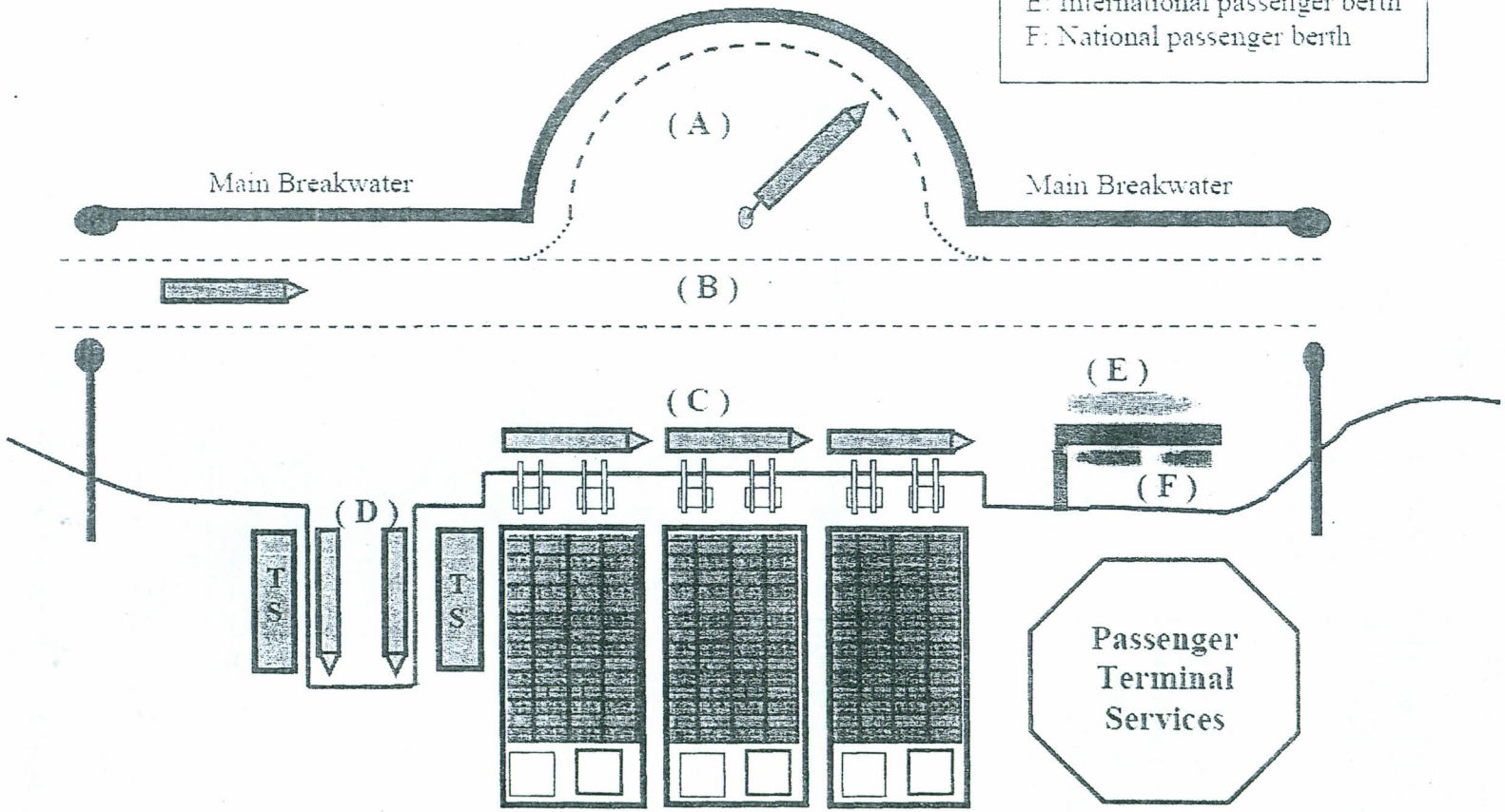

Figure 1: Suggested New Port on the North Coast of Egypt