BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environmental, Water Resources, and Coastal Engineering, Term Final (Spring) Examination 2023: Jul-Sep 2023

Student Group: Earned Credit Hours > 108

Subject: EWC 471, Basic Coastal Engineering

Time: 3.00 hours **Full Marks: 180**

INSTRUCTIONS:

a. Use **SEPARATE** answer scripts for each section.
b. **Question-1** in **Section-A** and **Question-5** in **Section-B** are compulsory
c. Answer any other **TWO** questions out of **THREE** from each section.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
f. **Symbols** and **abbreviations** used have their usual meanings.

SECTION-A

Question 1 (Compulsory)

a. What is Coastal Engineering? Explain Coastal features with a neat sketch. **10**

b. Illustrate the impacts of sea level rise and what types of adaptation measures you want to take against sea level rise impact in Bangladesh. **15**

c. Explain in brief the processes responsible for sediment transport. **05**

Question 2

a. What are the challenges faced by Bangladesh as a delta according to Bangladesh Delta Plan(BDP). **10**

b. Explain in brief the tidal cycle of Bangladesh. **10**

c. Explain in brief the features of a harbor. **06**

d. Write short notes on: (any two) **04**
   i. Priming of tide
   ii. Groyne
   iii. Sea wall

Question 3

a. Find the time of afternoon highwater at a place with the following data: **07**
Time of moon's transit on that day = 8h 40m
Mean establishment = 4h 40m
Age of tides = 2 days

Hour of Moon's transit	0	1	2	3	4	5	6	7	8
Correction in Minutes	0	-16	-31	-41	-44	-31	0	31	44

Hour of Moon's transit	9	10	11	12
Correction in Minutes	41	31	16	0

b. Explain the need for an integrated plan (BDP 2100) in water resources management in Bangladesh. **15**

c. Explain with a neat sketch various types of Delta. **08**

Question 4

a. What is tidal flow? Explain in brief the tidal characteristics of Bangladesh. **10**

b. Explain in brief the methods available for prediction of tides. **10**

c. Explain the national level strategies under Bangladesh Delta Plan 2100. **10**

SECTION-B

Question 5 **(Compulsory)**

a. "Waves are the prime movers for the littoral processes at the shoreline"- explain. **06**

b. Differentiate between **08**
   i. Swell and seiche.
   ii. Pure oscillatory waves and finite- amplitude waves.

c. A wave propagated with a wave period of T = 5 sec in a water depth d = 16m and a wave height, H = 2.5m. Find the local horizontal and vertical velocities at a depth 4m below the SWL when $\theta = [\frac{2\pi}{L}x - \frac{2\pi}{T}t] = \frac{\pi}{4}$ **10**

d. Briefly explain group velocity. Write the relation between group velocity and wave celerity for deep water and shallow water conditions. **06**

Question 6

a. Explain waves and current system in a nearshore coastal zone with necessary sketches. **10**

b. An average maximum pressure 1.30 kN/m^2 is measured by a subsurface pressure gauge located in the salt water 0.6m above the bed in depth 12m. The average frequency is 0.1 Hertz. **10**

c. "Water particle displacement from its mean position changes it's fashion when wave moves from deep to shallow water" – explain with necessary sketches. **10**

Question 7

a. Explain why do waves break and also explain why wave breaking is most common in shallow water than deep water. **06**

b. Write short note on- **08**
   i. Spilling
   ii. Surging
   iii. Wave Steepness
   iv. Wave setup

c. In deep water a wave has a height of 3.5 m and a period of 9 sec. The wave moves into a water depth of 8.5 m. Calculate the wave height at the new depth. The refraction coefficient is 0.91. If the same wave moves from 8.5 m depth to 6 m depth then calculate the new wave height. **12**

d. "Wave setup contributes significantly to coastal water rise and can cause coastal flooding in surf zone"- explain. **04**

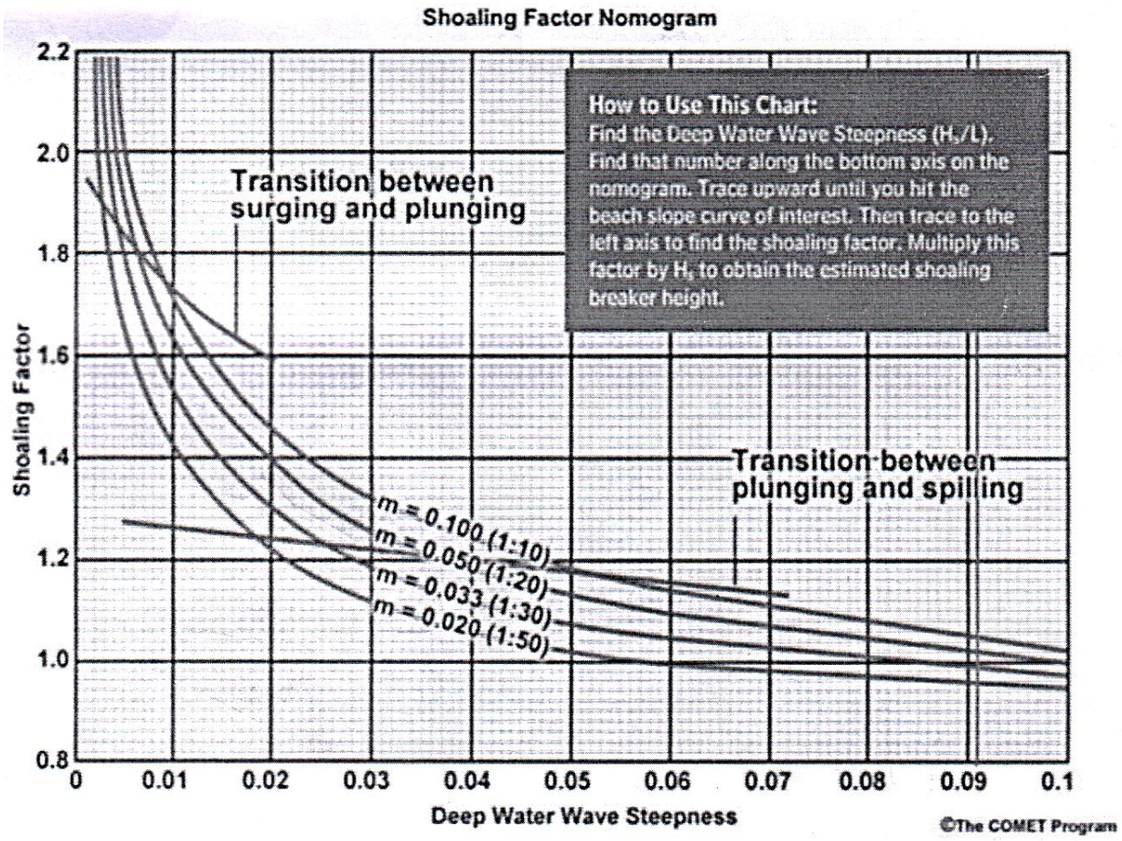
Question 8

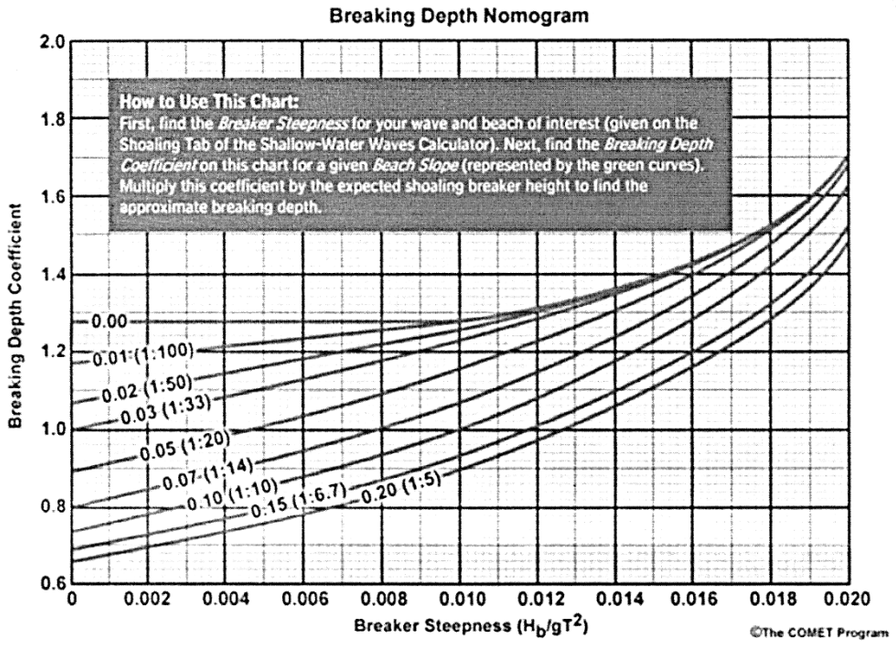
a. According to the Green's law show how wave height reaches infinity and also explain the reality of the fate of the wave. **05**

b. A smooth faced vertical wall is constructed at an offshore location where the wall encounters non-breaking wave force. The structure will be provided sufficient height to ensure non-overtopping scenario. Incident wave height is 2.7 m. Design depth of the structure is 5 m and design wave period is 9 sec. Find the dynamic, static and total force and dynamic, static and total moment created by wave crest and wave trough. Also find net force and net overturning moment on the wall during critical condition for same water level on both sides of the structure. Assume reflection coefficient $k_r = 1.0$. **20**

c. What are the basic assumptions to derive "Small Amplitude Surface Wave Theory" **05**

$u = \frac{H}{2}\sqrt{\frac{g}{d}}\cos\theta$	$u = \frac{H}{2}\frac{gT}{L}\frac{\cosh[2\pi(z+d)/L]}{\cosh(2\pi d/L)}\cos\theta$	$u = \frac{\pi H}{T}e^{\left(\frac{2\pi z}{L}\right)}\cos\theta$
$w = \frac{H\pi}{T}\left(1+\frac{z}{d}\right)\sin\theta$	$w = \frac{H}{2}\frac{gT}{L}\frac{\sinh[2\pi(z+d)/L]}{\cosh(2\pi d/L)}\sin\theta$	$w = \frac{\pi H}{T}e^{\left(\frac{2\pi z}{L}\right)}\sin\theta$
$a_x = \frac{H\pi}{T}\sqrt{\frac{g}{d}}\sin\theta$	$a_x = \frac{g\pi H}{L}\frac{\cosh[2\pi(z+d)/L]}{\cosh(2\pi d/L)}\sin\theta$	$a_x = 2H\left(\frac{\pi}{T}\right)^2 e^{\left(\frac{2\pi z}{L}\right)}\sin\theta$
$a_z = -2H\left(\frac{\pi}{T}\right)^2\left(1+\frac{z}{d}\right)\cos\theta$	$a_z = -\frac{g\pi H}{L}\frac{\sinh[2\pi(z+d)/L]}{\cosh(2\pi d/L)}\cos\theta$	$a_z = -2H\left(\frac{\pi}{T}\right)^2 e^{\left(\frac{2\pi z}{L}\right)}\cos\theta$
$\xi = -\frac{HT}{4\pi}\sqrt{\frac{g}{d}}\sin\theta$	$\xi = -\frac{H}{2}\frac{\cosh[2\pi(z+d)/L]}{\sinh(2\pi d/L)}\sin\theta$	$\xi = -\frac{H}{2}e^{\left(\frac{2\pi z}{L}\right)}\sin\theta$
$\zeta = \frac{H}{2}\left(1+\frac{z}{d}\right)\cos\theta$	$\zeta = \frac{H}{2}\frac{\sinh[2\pi(z+d)/L]}{\sinh(2\pi d/L)}\cos\theta$	$\zeta = \frac{H}{2}e^{\left(\frac{2\pi z}{L}\right)}\cos\theta$





$\frac{h_o}{H_i}$

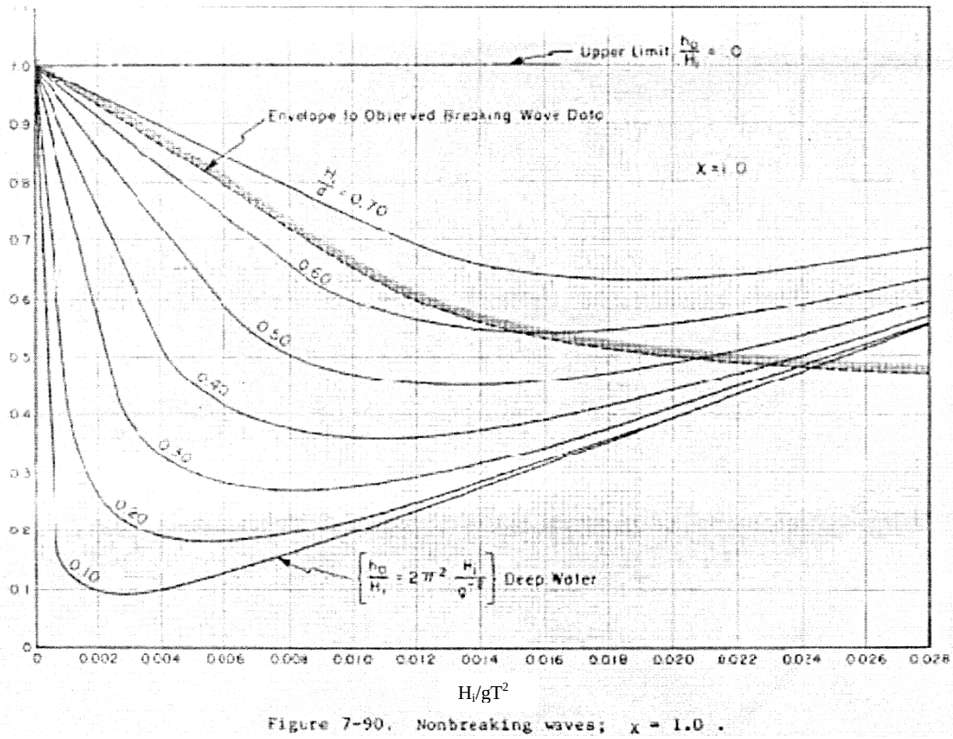


Figure 7-90. Nonbreaking waves; $\chi = 1.0$.

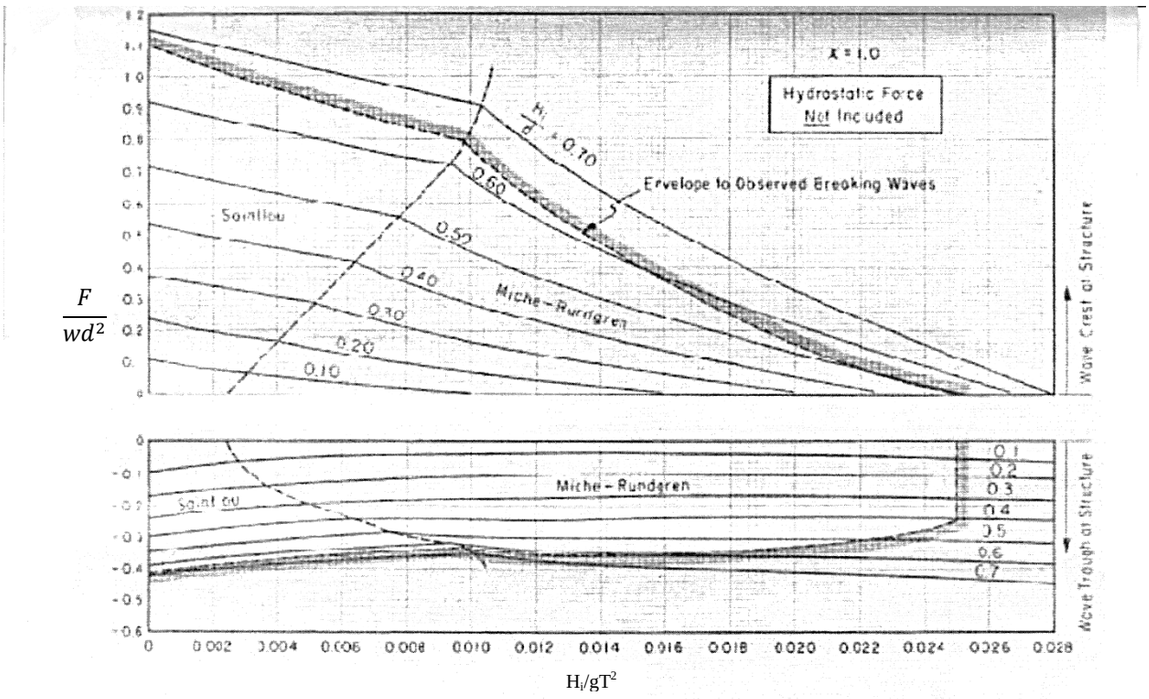


Figure 7-91. Nonbreaking wave forces; $\chi = 1.0$.

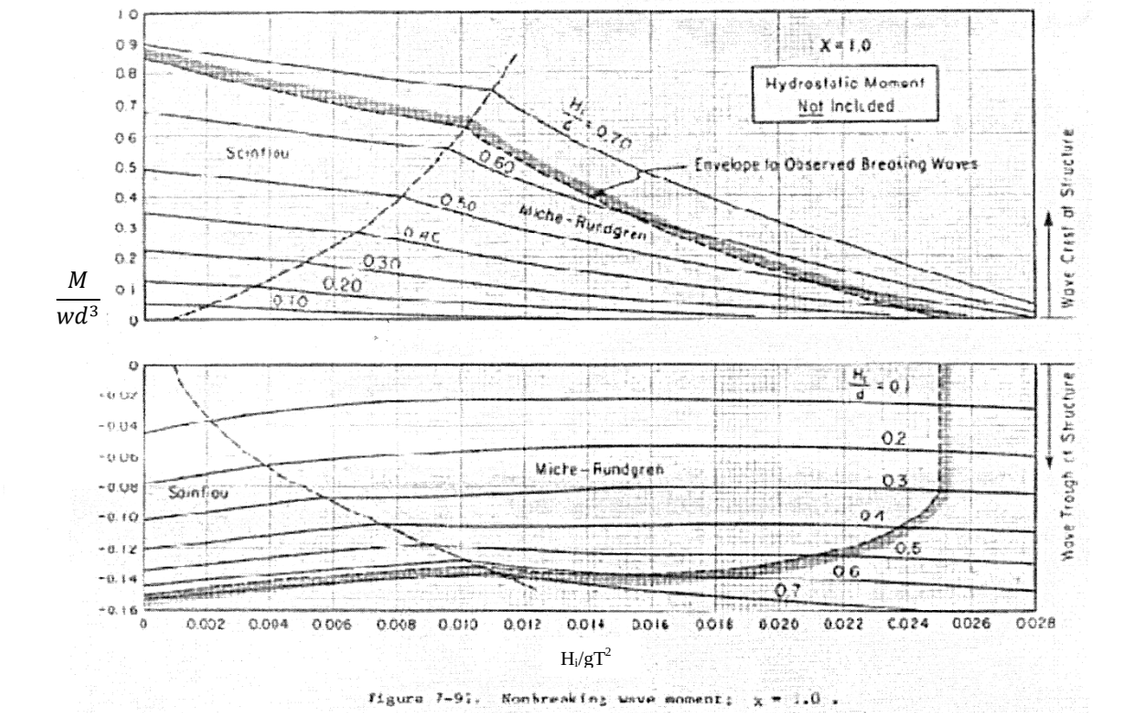


Figure 7-92. Nonbreaking wave moment; $\chi = 1.0$.