15.6.26 (Monday)

EWCE-471 (Shongi ma'am)

Lec-1

Ocean & sea:

Ocean → Largest

Sea → a part of ocean which is partially of fully enclosed by land

Exception → Caspian sea. Its not connected with any sea

Pacific
Ant Atlantic
Indian
Southern (Antantic)
Arctic
→ 5 ocean

Ocean vs Sea [IMPORTANT]

(Largest sea, ocean → সাগর ই)

Coastal engineering

Coastal sci

* Coastal area → ≈10 km long
Mangrove, Cox's Bazar (580 km),
Meghna estuary area

Coastal zone

Coast, shore, coastline, Shoreline [IMPORTANT]

Coast → H_2O ও land, but extreme event ছাড়া

shore → H_2O ও land

Beach → Shore এর যে Portion এ H_2O দ্বারা loose soil material থাকে create

Coastal Hinterland

Coast এর পেছনের City গুলোর impact

পড়ে।

(Bangladesh - coastline continuous. এজন্যই এর longest sea beach)

~~EWCE-471~~

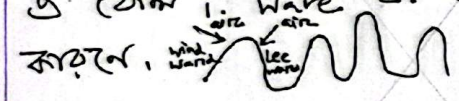
17.6.26 (Wednesday)

EWCE-471 (Shongi ma'am)

Lec-2-9

Wave → water surface movement
upward-downward
Transfer of energy

Air continuous pressure দেয় water surface. windward এ বাতাস, Leeward এ বাতাস। Wave এর size change হয় এই কারণে।



বাতাস H_2O Particle এর উপর pressure এর কারণে energy transfer হয়ে থাকে। Then এই energy এক particle এ Transfer এর মাধ্যমে water এ pressure দেয়। so different wave create হয়।

Wave create reason → wind
gravity (sun, moon)
earthquake
Landslide under ocean
volcanic activities.

Tides → because of moon & sun H_2O surface এর rise & fall in every water bodies.
periodic rise & fall
Longest waves
Wavelength $\leq \frac{1}{2}$ of earth circumference

Tide size is not always same. cause moon and sun distances from earth are not always same

Ques: Why tide are tide levels not always same?

High tides occurs at the point which facer at moon. Cause sun distance is much more than moon

Low tide → 90° angle of high tide

~~Interdi~~

Intertidal zone: submerged portion of shore and exposed at low tide.

$$F \propto \frac{m_1 m_2}{d^2}$$

Tide generating forces:

Gravitational force

Centrifugal force:

High tide এর opposite এ ~~of centrif~~ tide create হয়, Tidal bulge cause of centrifugal force → earth and moon revolve around one another.

(High tide)

Ques: Why second tidal bulge ~~are~~ are formed at opposite point of high tide?

For Bangladesh,

two high tides (tidal period = 12 hours 25 min)

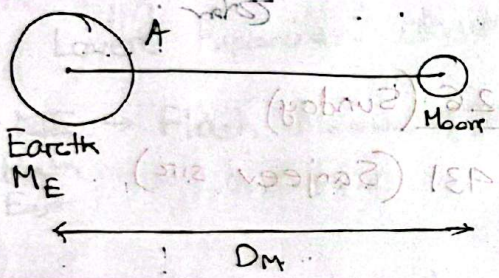
" low "

Ques: Why lunar day 24 hours 50 min? and Why ~~high tides~~ tidal period 12 hours 25 min?

22.6.26 (Monday) DONE

EWCE-421 (Shongimaʻam)

IMPORTANT



M_E = Mass of Earth

M_M = " " moon

M_S = " " sun

D_M = mean distance from center of Earth to the center of the moon

D_S = mean distance from center of earth to the center of the sun.

R = ~~readu~~ radius of earth

K = constant of gravitation.

Considering point A, facing the moon, Tide producing force F_M of the moon on unit mass at A is given by,

$$F_M = K M_M \left[\frac{1}{(D_M - R)^2} - \frac{1}{D_M^2}\right]$$

$$= K M_M \left[\frac{R(2D_M - R)}{(D_M - R)^2 D_M^2}\right]$$

Assuming radius of the earth R very small ~~is~~ in ~~comparesion to~~ comparison to the distance between earth & moon,

$$F_M \approx K M_M \frac{2R}{D_M^3}$$

Similarly, tide producing force F_S of the sun on unit mass ~~of~~ at A is given by,

$$F_S \approx K M_S \left(\frac{2R}{D_S^3}\right)$$

Hence,

$$\frac{F_S}{F_M} = \frac{M_S}{M_M}\left(\frac{D_M}{D_S}\right)^3$$

Now, mass of sun, $M_S = 2\times10^{30}$ Metric Tons

" " moon, $M_M = \frac{1}{27}\times3\times10^{19}$

$D_S = 149\times58000$ km

$D_M = 384\,835$ km

$$\frac{F_S}{F_M} = \frac{2\times10^{30}}{3\times10^{19}} \times \left(\frac{384\,835}{149\times58000}\right)^3$$

$= 0.464$

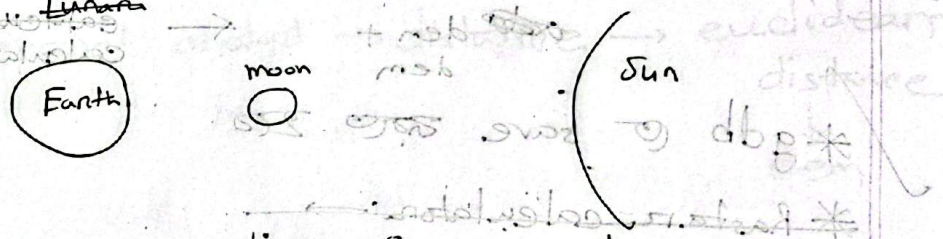
$\therefore 46\%$

DONE

Why 24 hours 50 min?

Day → 24 Hours

Lunar →



Moon → eastward 13° movement

24 hours = 360°

13° = 52 min ≈ 50 min

Solar day

Then Lunar "

* Moon, earth এ respect এ fixed ভাবে 13° eastward

Difference between the tidals [IMPORTANT]

Fig লিখে রাখো

24.6.26 (Wednesday) DONE

EWCE-4 (Shongi ma'am)

- Phases of moon
- Monthly tide cycle
- Tide envelope
- Spring tide : 2 বার হয় in a month

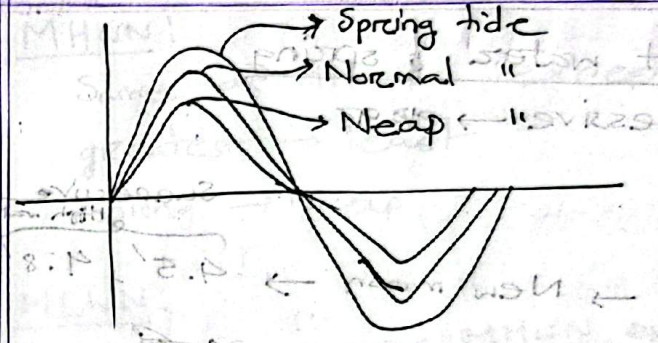
Full Moon, Earth, Sun (19th day)
* Moon + Centrifugal action
* Sun + Centrifugal action

New Moon, Earth, Sun (0 day)
* Moon + Sun action

*attraction যখনই বেশি

- Neap tide : 2 spring tides এর মাঝে

Sun, moon → 90° angle



- Tidal current
  - Flood current → Coast এর দিকে আসে
  - Ebb " → opposite direction

Ebb tide → Ebb current
Flood " → Flood "

- Tidal curve
- Tidal range : High water & low water এর vertical distance
- Tidal level
- Tider terms

Fig আসবে (Graph)

Mean Height water & spring

successive → পরপর.

Example:

1st may → New moon → 4.5', 4.8' (Successive High waters)

14th " → Full moon → ~~4.8~~ 5.1', 5.2'

~~spring tide~~ এবার প্রত্যেক month 2টা.

~~+2 month~~

spring tide পাবে,

24 hours এ কয়টি High and low water

12 month এ কয়টি, tide এ range কিভাবে নির্ণয়? successive ht এ mean and তার থেকে spring tide এ সমস্যা।

MLWS: High → low

~~greatest → smallest~~

Same day as MHWS

DONE

MHWN:

Same as MHWS except

greatest → least

spring → Neap

MLWN:

~~low~~ Same as MHWN except

~~low~~ High → Low

Neap tide এ তার কোন High or low

হয় ir like spring tide

Mean spring and mean neap range

Highest & lowest astronomical tide

Astronomical + meteorological condition এর combination.

Date: ...../...../.....

- ✱ 30 min gap
- ✱ diff time এ high tide কত

spring, mid tide

sun moon gravity tide

✱ grap re of Tidal term
দুইবি

MHWS MHWN - - -

defi

✱ Tidal cha of BD

✱ deri

30.6.26 (Tuesday)

EWCE - 431 (Azam Sir)

1.7.26 (Wednesday)

EWCE - 431 (Shongi)

Lec-6-7

Ship এর maintenance → Harbor

Port এর ২টা Part → 1।

enclosed
protected
Ship এর shelter

Harbor এ H_2O তুলনামূলক
কোন calm water

Classification → min ৩টা example দিতে হবে

* Coastal process

IMPORTANT
For CT & Final

DONE 6.7.26 (Monday)

EWCE - 421 (Shongi ma'am)

Lec-2-8

- Port vs Harbor [Compulsory ques to aaye]
- Terms
- Site selection
- Features of Harbor
- Harbor layout → fig must → [IMPORTANT]
- ~~Facts~~
- Requirements of ~~Ha~~ Good Harbor

[08-07-26]

Lec-08: Coastal Processes & Sediment Transport

Coast:

Size of a wave depends on →

(i) length of time the wind has been blowing
(ii) Strength of the wind
(iii) Fetch – how far the wind has blown

Diff types of waves with characteristics:

Constructive
Destructive

- swash
- backwash

(Wavelength, Frequency)

Continental Shelf:

[15-07-26]

Coastal processes:

Effects of coastal developments on coastal zone processes (with exp)

- Processes of Erosion
- Landforms of Erosion

Erosion structures

- # Hard [Concrete, Reinforcement etc]
- # Soft [Nature based solution]

Modes of Sediment Transport:

- # Bed load transport
- # Suspended load transport
- # Wash load transport

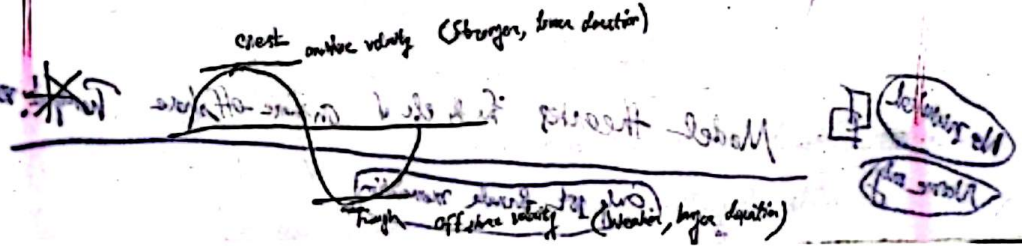
(X3)

Beach profile with (fig): [water body must be included]

- # Backshore
- # Foreshore / Intertidal zone
- # Nearshore
- # Offshore
- # Swash zone
- # Surf zone
- # Breaker zone
- # Shoreface

Sediment transport:

- # Off-shore transport
- # On-shore transport



Mechanisms causing beach profile change:

1. Wave motion
2. Gravity
3. Undertow & Rip current
4. Turbulence from broking waves
5. Wind effects.

PDF 8.2 P-261

Model theories for the calculation of longshore drift:

(i) Energy flux model

(ii) Empirical model.

(iii)

Model theories for the calculation of onshore-offshore

(only for breaker zone)

Numericals

Final

Derivation No need

Prediction of potential longshore sediment transport rate:

The potential longshore sediment transport rate,

$$P_l = (EC_g)_b \sin\alpha_b \cos\alpha_b$$

$$= (EC_g)_b \sin 2\alpha_b \times \frac{1}{2}$$

Where, E_b is the wave energy evaluated at the breaker line.

$$E_b = \frac{\rho g H_b^2}{8}$$

& C_{g_b} = wave group speed at the breaker line

$$= \sqrt{g d_b} = \sqrt{g \frac{H_b}{K}}$$

(K → Kappa)

K = breaker index $= \frac{H_b}{d_b}$

H_b = breaker height

d_b = water depth at the breaker line.

$(ES)_b$ = wave energy flux evaluated at the breaker zone.

α_b = Wave breaker angle relative to the shoreline.

Immersed weight transport rate:

$$I_l = K P_l$$

$$= K \left(E C_g\right)_b \frac{1}{2} \sin 2\alpha_b$$

$$= K \left(\frac{\gamma g H_b^2}{8}\right)_b \left(\frac{g H_b}{K}\right)^{\frac{1}{2}} \frac{1}{2} \sin 2\alpha_b$$

$$\Rightarrow I_l = K \left(\frac{\gamma g^{\frac{3}{2}}}{16 K^{\frac{1}{2}}}\right) H_b^{\frac{5}{2}} \sin 2\alpha_b$$

The longshore sediment transport rate is expressed as the potential volumetric longshore transport rate (Q_l)

$$Q_l = \frac{I_l}{(\rho_s - \rho) g (1-n)}$$

where,

ρ_s = Mass density of the sediment grains
= 2650 kg/m³ for quartz density sand

ρ = mass density of water
= 1025 kg/m³ for 33 ppt salt water

n = In place sediment porosity = 0.41

g = Acceleration due to gravity = 9.81 m/s²

K = 0.78 for flat beaches
(typ) > 1.0 (depends on beach slope)

$$K = 0.05 + 2.6 \sin^2(2\alpha_b) + 0.007 \frac{u_{mb}}{w_f}$$

w_f = fall velocity

u_{mb} = Maximum oscillatory velocity magnitude

$$\Rightarrow u_{mb} = \frac{K}{2} \sqrt{g H_b}$$

Waves having an rms value Hb of 2m break on a planar sandy beach of a wave tank with slope = 4.5°. The temperature of the seawater is 20°C and the fall velocity of the sediment is 131 cm/sec. Assume K = 1.0. Calculate the potential volumetric longshore transport rate along the beach.

$$Q_l = K \left[\frac{\gamma \sqrt{g}}{16 K^{\frac{1}{2}} (\rho_s - \rho)(1-n)}\right] H_b^{\frac{5}{2}} \sin 2\alpha_b$$

Sol: $H_b = 2m$, $u_{mb} = 2.21$ m/s, $K = 0.93$, $Q_l = 0.042$ m³/sec.
= 3628.8 m³/day

✡ ✡ Coastal Processes ✡ ✡

ct + final

✡ Mechanism causing beach profile change

$$q_s = k(D - D^*)$$

q_s = Term গুলা বুঝা

$D > D^*$ → offshore

✡ Prediction of Potential Longshore Transport Rate

The potential longshore ~~trat~~ sediment transport rate, $P_l = (Ec_g)_b \sin\alpha_b \cos\alpha_b$

$$= (Ec_g)_b \frac{1}{2}\sin 2\alpha_b$$

where E_b is the wave energy evaluated at the breaker line

$$E_b = \frac{\rho g H_b^2}{8}$$

c_{gb} = wave grp speed at the breaker line

$$= \sqrt{gd_b} = \sqrt{g\frac{H_b}{k}}$$

↳ Kappa

k = breaker index

$$= \frac{H_b}{d_b}$$

H_b = breaker ht

d_b = water depth at breaker line

$(EC_g)_b$ = wave energy flux evaluated at the breaker zone

α_b = wave breaker angle relative to the shoreline

Immersed weight transport rate,

$$I_l = KP_l = K\left(E_{(g)_b}\frac{1}{2}\sin 2\alpha_b\right)$$

$$= K\left(\frac{\rho g H_b^2}{8}\right)\left(g\frac{H_b}{K}\right)^{\frac{1}{2}}\frac{1}{2}\sin 2\alpha_b$$

$$I_l = K\left(\frac{\rho g^{\frac{3}{2}}}{16K^{\frac{1}{2}}}\right)H_b^{5/2}\sin 2\alpha_b$$

The longshore sediment transport rate is expressed as the potential volumetric longshore transport rate (Q_l)

$$Q_l = \frac{I_l}{(\rho_s - \rho)g(1-n)}$$

ρ_s = mass density of the sediment grains
= 2650 kg/m³ for quartz density sand

ρ = mass density of water
= 1025 kg/m³ for 33 ppt salt wate

n = In place sediment porosity $= 0.4$

g = acceleration due to gravity $= 9.81\ ms^{-2}$

$K = 0.78$ for flat beaches

> 1.0 (depending on beach slope)

$$K = 0.05 + 2.6 \sin^2(2\alpha_b) + 0.007 \frac{U_{mb}}{w_f}$$

w_f = fall velocity

U_{mb} = maximum oscillatory velocity

$$\text{magnitude} = \frac{K}{2} \sqrt{g d_b}$$



Derivation lagbe na... formula shikhte hobe

1:46 pm

CamScanner

n = In place sediment porosity = 0·4

g = acceleration due to gravity = 9·81 ms^{-2}

K = 0·78 for flat beaches

> 1·0 (depending on beach slope)

$$K = 0.05 + 2.6 \sin^2(2\alpha_b) + 0.007 \frac{U_{mb}}{w_f}$$

w_f = fall velocity

U_{mb} = maximum oscillatory velocity

$$\text{magnitude} = \frac{K}{2}\sqrt{g d_b}$$

Math $H_b = 2$, $\rho_s = 2650$, $\rho = 1025$

$\alpha = 4.5$, $Q_s = ?$ $K = 1$, $g = 9.81$, $n = 0.4$, $K = ?$

$w_f = 0.131$ ↳ kappa

~~$I_x =$~~

$$Q_s = K\left[\frac{\rho\sqrt{g}}{16K^{\frac{1}{2}}(\rho_s - \rho)(1-n)}\right] H_b^{5/2} \sin 2\alpha_b$$

$$= 1\left[\frac{1025\sqrt{9.81}}{16 \times 1 \times (}\right.$$

$K = \frac{H_b}{d_b}$

$1 = \frac{2}{d_b}$ ∴ $d_b =$

$$U_{mb} = \frac{K}{2}\sqrt{g d_b} = \frac{1}{2}\sqrt{9.81 \times 2} = 2.21\ m/$$

$$K = 0.05 + 2.6 \sin^2(2 \times 4.5) + 0.007 \frac{2.21}{0.131}$$

$$= 0.23$$

$$Q_2 = 0.23 \left[\frac{1025 \sqrt{9.81}}{16 \times 1 \times (2650 - 1025)(1 - 0.4)} \right]$$

$$= 0.04 \times 2^{5/2} \times \sin(2 \times 4.5)$$

$$= 0.042 \ m^3/s = 3628.8 \ m^3/day$$

Flat beach $\longrightarrow$ $K = 0.78$

22.7.26 (Wednesday) DONE

EWCE - 971 (Shongi ma'am)

Deltas & Its Characteristics

Topset, bottom set etc → Fig important

Morphology → 2nd fig "

* Ques → River sediment carry 2M

~~M~~ ~~FCD~~, ~~2M~~ Triangular shape

create 2M, (formation of delta)

22.7.26

Distribution Network → quality, quantity,

pressure → F/B

27.8.26 (Monday) DONE

EWCE-471 (Shongi ma'am)

Stage-1

চলবে। image ই important

Fig must দিতে হবে.

প্রত্যেক Type এর একটা example লাগবে

8.2, 8.3 (P-252-253) From book

$$EIV = \sum_{i=1}^{n} (V_i) w_i$$

29.7.26 (Wednesday)

EWCE – 471 (Shongi ma'ani)

BDP

* Hotspot (P-7, 8) ⟶ Defn
  Bangladesh's hotspot area, issue, challenge (4 atleast)
  (Numeric value লাগবে না)
* Delta challenges (P-3,) > Numerical value লাগবে না
  " opuritunities (P-5)
* Strategies B (P-15)
  ↳ Main strategies
  @ 5 measures per hotspot
* Difference among Semidiurnal, Diurnal, Mixed
  ↳ Number of high & low tide
  Duration
  Tide size
  Fig & time value চেয়েছে

10.8.26 (Monday)

EWCE -471 (Shongjukto'aan)

Lec-14-15

Newton:

Theory
কী কী explain করা যায়
limitation

Laplace → theory র জন্য Important

Prime & lagging → Fig

17.8.25 (Monday)

EWCE - 471 (Shongimalam)

IMPORTANT

Non harmonic constant → 4 phase details

Harmonic → 9 to 12 list name & time period

IMPORTANT

Math:

Soln:

We know that the moon falls behind the ~~the~~ sun at a rate of 50m per day. Hence at the birth day of tide, 2 days earlier, the time of moon's transit = 4h40m - (2×50)m

= 3h.0m

From the table, corresponding to the time of moon's transit of 3h 0m, the correction for priming = -41m

Therefore, lunitidal interval = mean establishment + correction = 3h 10m − 41m = 2h 29m

Now, the time of high water = time of moon's transit + lunitidal interval

= 4h 40m + 2h 29m

= 7h 09m = 7:09 pm

Table এ value না থাকলে interpolation.

-ve → priming → High H_2O আসার আগে আসা

+ve → lagging → পরে।

Math:

Time of the moon's transit on day = 3h 20m

Mean establishment = 3h 15min

Age of tides = 3 days

3 days earlier = 3h 20min. − 2×50

= 12h 50mi-

[means 0h 50min]

Correction = −13.33min ≈ −13min

(Round করতে হবে)

Lunitidal interval = 3h 2min

time of high water = 3h 2min + 3h 20min

= 6:22 pm

24.8.26 (Monday)

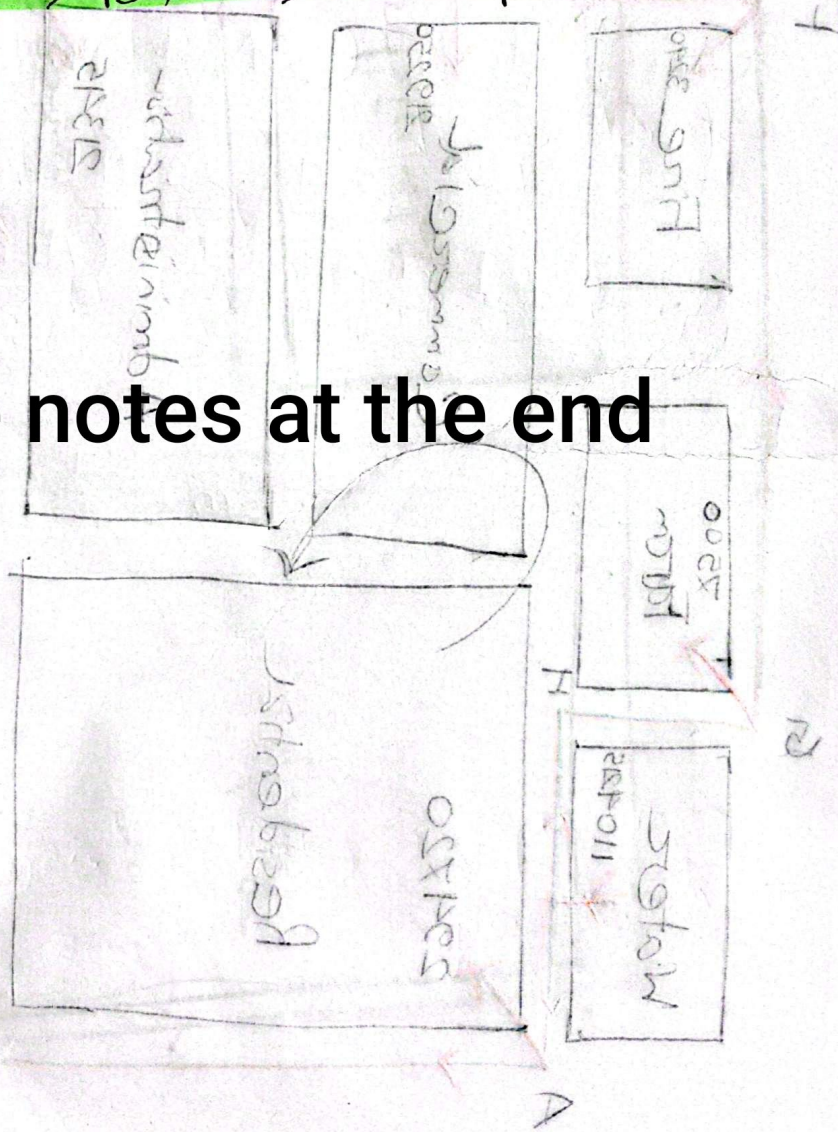
EWCE - 4 (Shongi ma'am)

Coastal structure → Slide এর চেয়ে Pdf বেশি important

[Compulsory হবে]

Sea wall → Pdf → exception দিবে

Groin



more notes at the end

30.8.26 (Sunday)

EWCE - 471 (Shongi mohona instead of Rafid Sir)

Detached breakwater:

P-10, 11

P-11 → 1st Para
2nd "
3rd " (Like groin)
4th " (3d Type material, Ht of crest কেমন)
2or
পরের Para গুলো না

Short ques: What type of structure?
function? (2nd Para)
Transaction কী হবে? (3rd Para)

Reef breakwater: (P-11)

Submerged sills (P-11)

Beach drain (P-11, 12) [Short ques আসতে]

Beach nourishment & dune construction (P-12)

Breakwater (P-12): [এই পর্যন্ত ১১১ Thoroughly পড়তে হবে]

1st Para
2nd "
3rd "

Floating breakwater: (P-13)

Jetties: (P-13)

Training walls: (P-13)

Storm surge barrier: (P-13)

Pipeline
Pile structure:
Scour protection

func আসতে just material আসতে just (P-12)

P-9 → Obj, Table func
obj, ~~principle~~
Example ques: 8 or 10 structure obj + func for

Figure VI-2-1, 3, 7, 8 (must), 10, 13, 17, 25 (important)

must

Rumble mound breakwater

Failure: (P-27)

Defn লাগবে না।

Q: failure mode গুলো কী কী

Failure reason লাগবে

Fig Seawall failure। Drawing লাগবে

Ir, fig name লাগবে

Floating structure: P-50 (failure)

31.8.26 (Monday

~~Echoe~~

EWCE - 471 (Shongi ma'am)

P-92

Design wave ht H = 4.2'

" " period T = 4.25s

RL of rocked level = + 11' MLLW

Storm surge ht = 3'

50 year high H_2O level = + 1.92 MLLW

MHHW = +1.92' MLLW

Bed level at the end of bank slop = +1 MLLW

Bottom slope of sea bed = 1:10

Revetment design:

Design H_2O level = Storm surge ht + 50 year H_2O level

= 3 + 1.91 = 4.91' MLLW

a) Breaking wave criteria:

d_s = H_2O depth at the structure (max^m - min) H_2O level in front of structure

= 4.91 - 1 = 3.91'

T = 4.25s

nearshore bottom slope, $m = \frac{1}{10} = 0.1$

$$\frac{d_s}{gT^2} = \frac{3.91}{32.2 \times 4.25^2} = 0.006$$

From graph, $\frac{H_o}{d_s}$ vs $\frac{d_s}{gT^2}$,

$$\frac{H_o}{d_s} = 1.95$$

H_b & H গ্রেফ সঠিক হবে smaller টা first design

$$H_b = 1.95 \times 3.91 = 5.6' > 4.2'$$

Using $H = 4.2'$ for design

b) Armor size determination:

$$W = \frac{\gamma_R H^3}{K_D \left(\frac{\gamma_R}{\gamma_W} - 1\right)^3 \cot\theta}$$

W = required individual armor unit wt, lb
(or W_{50} for graded riprap)

γ_R = Specific wt of the armor unit, lb/ft³

γ_W = " " " H_2O at the site

K_D = stability co-eff.

θ = Structure slope

① Riprap:

$\cot\theta = 2$

$\gamma_R = 165$ lb/ft³

$\gamma_W = 64$ lb/ft³

$K_D = 2$ } Memorize

$$W_{50} = \frac{165 \times (4.2)^3}{2.2 \times \left(\frac{165}{64} - 1\right)^3 \times 2} = 705 \text{ Lb}$$

Graded riprap this large may be difficult to obtain economically [$W_{50} < 500$ lb riprap for design. In এর quarrystone ই]

② Quarrystone:

$\cot\theta = 1.5$ to 3 } memorize

Assume $\cot\theta = 2$

$K_D = 2$

$$W = \frac{165 \times 4.2^3}{2\left(\frac{165}{64} - 1\right)^3 \times 2} = 780 \text{ lb}$$

The range of armor stone weights for a cover layer of 2 quarrystones could be vary from 0.75kW to 1.25 kW or 585 Lb to 975 Lb with about 50% of the individual stones weighing more than W (780 Lb).

Armor layer thickness:

$$r = n K_\Delta \left(\frac{W}{\gamma_r}\right)^{1/3}$$

r = layer thickness in feet

n = num of armor units layer

K_Δ = layer coeff = 1 [memorize]

$$r = 2 \times 1 \times \left(\frac{780}{165}\right)^{\frac{1}{3}} = 3.4'$$

Num of quarrystones per area,

$$N_r = A n K_\Delta \left(1 - \frac{P}{100}\right) \left(\frac{\gamma_r}{W}\right)^{2/3}$$

P = avg porosity of the cover layer [memorize]

= 37%

Using $A = 1000\ ft^2$

$$N_r = 1000 \times 2 \times 1 \left(1 - \frac{37}{100}\right) \left(\frac{165}{780}\right)^{2/3}$$

$= 450$ stones per $1000\ ft^2$

d) Wave runup estimation

$$\frac{H_s}{H_{mo}} = \exp\left[c_0 \left(\frac{d}{g T_p^2}\right)^{c_1}\right]$$

c_0, c_1 = regression co-effs given as 0.00089 & 0.834 respectively [memorize]

g = acceleration gravity

T_p = period of peak energy density of the wave spectrum.

$H_{mo} = 9.12'$

H_{mo} = energy based ht of the zeroth moment

$$\frac{4.2}{H_{mo}} = \exp\left[0.00089\left(\frac{15}{32.2\times 4.25^2}\right)^{-0.834}\right]$$

$$= 1.019$$

$$\Rightarrow H_{mo} = \frac{4.12'}{1.019}$$

Max runup:

$$\epsilon = \frac{\tan\theta}{\left(\frac{2\pi H_{mo}}{g T_p^2}\right)^{1/2}} = \frac{0.5}{\left(\frac{2\pi\times 4.12}{32.2\times 4.25^2}\right)^{1/2}}$$

$$= 2.37$$

$$R_{max} = \frac{a\epsilon}{1+b\epsilon}$$

R_{max} = max vertical ht of the runup above the SWL

a, b = regression co-eff determined as 1.022 and 0.247 respectively

Compulsory → definitly math

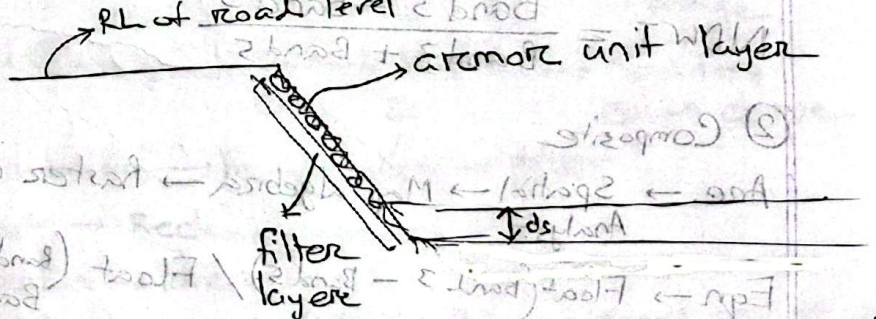
ϵ = surf parameter

$$\frac{R_{max}}{4.12} = \frac{1.022\times 2.37}{1+(0.247\times 2.37)} = 1.53$$

$$\Rightarrow R_{max} = 6.29'$$

Crest elevation = 4.91 + 6.29 = 11.2'

$\simeq$ 11.25'



* C → from pdf (P−9%) quarry stone

Table 2.3, 2.9 for data

[24-03-26]

Seawall design:

will be given { Significant wave height, $H = 1.524$ m

Depth of water, $d = 2.524$ m [If d is not given, $d = H + 1$]

will be given { Time period of approaching wave, $T = 7.468$ sec

Stability coefficient, $K_D = 2$

Unit weight of armor unit, $\gamma_a = 2.65$ T/m^3

Density of seawater, $\gamma_w = 1025$ T/m^3

Layer coefficient $k_\Delta = 1$.

will be given { Slope, $\phi = 1$ in 1.5

$\cot\phi = 1.5$

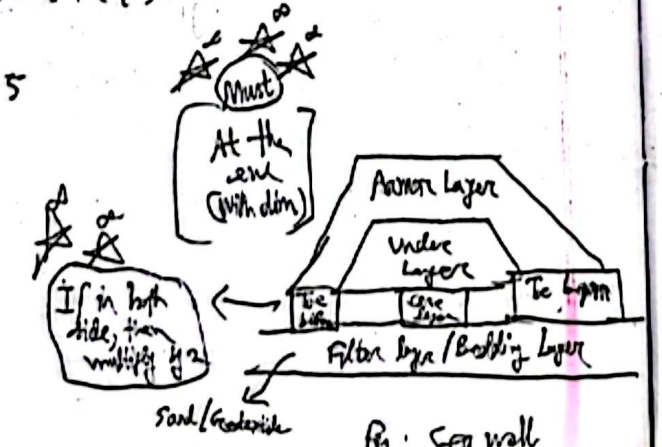


Fig: Sea wall

Sol:

(a) Armor Layer Design:

Weight of armor unit,

$$W_a = \frac{\gamma_a H^3}{K_D \left(\frac{\gamma_a}{\gamma_w} - 1\right)^3 \cot\phi} = \frac{2.65 \times (1.524)^3}{2 \times \left(\frac{2.65}{1.025} - 1\right)^3 \times 1.5} = 0.78467\ T = 785\ kg$$

Crest width of armor layer,

$$B = n k_\Delta \left(\frac{W_a}{\gamma_a}\right)^{1/3}$$

$= 3 \times 1 \times \left(\frac{0.785}{2.65}\right)^{1/3}$

$= 1.9998$ m.

n = number of stones

$= 3$

Thickness of armor layer,

$$t = n k_\Delta \left(\frac{W_a}{\gamma_a}\right)^{1/3}$$

where, $n = 2$.

$t = 2 \times 1 \times \left(\frac{0.785}{2.65}\right)^{1/3} = 1.3332$ m.

CamScanner

CamScanner

$$\frac{d}{gT^2} = \frac{2.524}{9.81 \times (7.40)^2} = 0.00461$$

$$\frac{H}{gT^2} = \frac{1.524}{9.81 \times (7.40)^2} = 0.00279$$

From graph we get,

$$\frac{h_c}{H} = 0.86$$

$\therefore h_c = 0.86 \times 1.524$

$= 1.31$ m.

Crest elevation $= (2.524 + 1.31)$ m

$= 3.834$ m.

(b) Under layer design:

Weight of under layer $= \frac{W_a}{10}$ to $\frac{W_a}{15}$

$= \frac{0.785}{10}$ to $\frac{0.785}{15}$

$= 0.0785\,T$ to $0.053\,T$

Thickness of under layer = Depth of armour $= 1.3332$ m.

(c) Core layer design:

Weight of Core layer $= \frac{W_a}{100}$ to $\frac{W_a}{400}$

$= 0.00785\,T$ to $0.00196\,T$.

CamScanner

CamScanner

(d) Toe beam design :

Weight of the beam = $\frac{W_a}{10}$ to $\frac{W_a}{15}$ = 0.0785 T to 0.0523 T

width of the beam = 2H = (2×1.524) m = 3.048 m.

Depth of the beam = 0.4 d = (0.4 × 2.524) m = 1.0096 m

Depth of one layer = Depth of the beam = 1.0096 m

Structure height = Thickness of arrow layer + Thickness of under layer + Depth of the beam + Thickness of bedding layer

= (1.3332 + 1.3332 + 1.0096 + 1.0096) m

= 4.655 m.

Weight of structure = Wt of Arrow unit + Wt of under layer + Wt of one layer + weight of the beam

= 0.94985 T.

21.9.26 (Monday)

EWCE - 421 (Shongi ma'am)

IMPORTANT

Prev year 2024 → 2025

Math

Coastal structure → func

failure mode

Table → 5-X structure

a → defn, reason of fail

b → sloping front structure

1 → 1st fig (breakwater)

→ Seawall (4 fail caption no need of pic)

→ sea dike

C → vertical (এর)

d → Floating (4 টা failure হবে)

Harbour layout

Beach profile → zone

Seawall, revetment → math important
(সংজ্ঞা) (pic এসাইন)

Simlia Maam sat sun mon ✓ tue wed thu fri Date 22.08.26

What do Coastal Structures Do?

1. Stop water
   - 1a. Stop flooding
   - 1b. Stop impact
2. Hold soil
   - 2a. Hold upbeach soil
   - 2b. Slow down sand transport

→ Protect infrastructure from flooding due to

Compulsory from this lec.

V.V.S

Soft Vs Hard

→ Hard coastal structures are engineered solutions designed to resist or prevent coastal erosion and damage.

→ Soft coastal structures involve natural or nature-based solutions that work with natural processes to protect.

Slide 8: a, b এইগুলো exception আসবে না।

sat sun mon tue wed thu fri Date

Revetment

c) d)

Bulkheads.

d)

Groins. eeeration → deposition

e)

The orientation — para এর Last line
বরাবর হবে

Groins occasionally — para However
line এর

তারপর The landward end of the para
বরাবর হবে। নিচের 7 line বরাবর এবারের,
শেষের para ও এরকম।

(Sruthi Maiam) Lec-16-17 24/08/26

What do coastal structures do?

* Coastal structures of functional areas.

- This lec. is v.v.imp. (compulsory)

- diff. sea structures in depth ~~explanat~~ explanation in book → (slide - 8 : types & functions of ~~coas~~ coastal structures

  1) sea dikes 3) seawall

- ~~125~~ ~~for~~ ~~225~~ flow ~~ಅನುಸರ~~ → updrift side