L-4/T-2/CE **Date : 01/10/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B.Sc. Engineering Examinations 2017-2018

Sub : **WRE 411** (Hydraulic Structures)

Full Marks: 140 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Discuss the types of diversion weirs with sketches. **(13)**

   (b) List down the design considerations for constructing under sluice portion of diversion head works. **(4)**

   (c) Sketch the plan of a silt ejector and identify its components. **(6 1/3)**

2. (a) List down the major functions of canal head regulator and sketch a typical section of a regulator. **(6)**

   (b) What are the major advantages and disadvantages of slit excluder as a slit control device? **(5)**

   (c) Annual runoff in terms of depth over catchment area of 1675 sq. km of reservoir is given below. Draw the flow mass diagram. What is the average yield from the catchment? Assume reasonable value for any missing information. **(12 1/3)**

Year	1962	1963	1964	1965	1966	1967	1968	1969
Runoff (cm)	98	143.5	168.3	94	95.3	152.4	110	131.3

3. (a) Differentiate between the followings (i) Weir and Barrage (ii) Guide banks and Marginal Bunds **(6)**

   (b) Write short note on "Bligh's creep theory". **(6)**

   (c) Discuss on the storage zones of reservoir with sketch. **(11 1/3)**

4. (a) Differentiate between the followings (i) Retarding basin and storage reservoir (ii) Silt Excluder and Slit ejector (iii) Piping and direct uplift. **(9)**

   (b) The concrete floor of a head regulator as shown in the Figure 1 is level with the canal bed and is 13m long. The floor is provided with cutoff walls at its upstream and downstream ends. The depth of upstream cutoff is 1.5m and that of the downstream wall is 2m. Using Khosla's theory determine the thickness of the floor at its mid length and also at its junction with the upstream and downstream walls. The floor thickness may not be less than 30cm anywhere. The upstream FSL is 1.5m above the floor level. Assume reasonable value for any missing information. **(14 1/3)**

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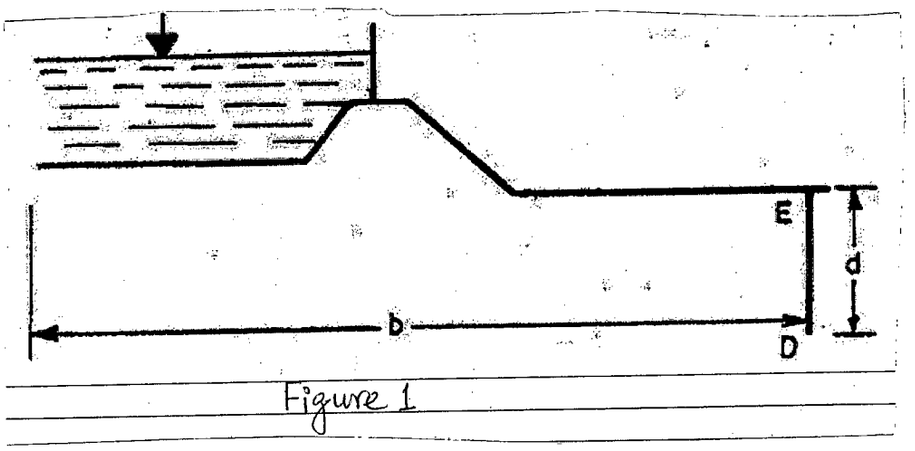

Figure 1

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Prove that the resultant force of gravity dam must lie within the middle third of the base of the dam. **(5 1/3)**

(b) Write down the problems in dam construction. Describe the factors that govern in selection of dam site. **(5+5=10)**

(c) Define energy dissipaters. Sketch the U.S.B.R stilling basin II and briefly describe the components. **(2+6=8)**

6. (a) Sketch the following: **(2×3=6)**

(i) Water pressure on gravity dam, (ii) Earthquake forces on gravity dam and (iii) Wave pressure on gravity dam.

(b) Design the downstream portion of an ogee spillway for a dam having the following characteristics. The u/s face is vertical and the d/s portion is having a slope of 0.7H: 1V. The design discharge is 9000 cumecs. The height of spillway crest is at RL 312 m and the bed elevation is 200m. Spillway length consists of 6 spans having clear width of 10 m each. Pier thickness is 2.5 m, Kp = 0.01 and Ka = 0.1. **(17 1/3)**

7. (a) Write down the difference between syphon aqueduct and syphon. Draw a typical plan and cross-section of a canal siphon. **(6 1/3)**

Contd P/3

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Contd... Q. No. 7

(b) Figure 2 shows the section of a non-overflow portion of gravity dam built of concrete. Neglecting the earth quake effects, calculate **(17)**

(i) major principle stress at toe.

(ii) Shear stress on a horizontal plane near toe.

Assume the unit weight of concrete as 24 kN/m^3.

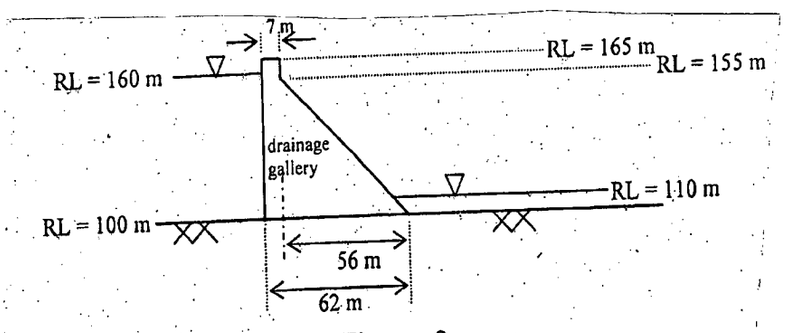

Figure : 2

8. (a) Sketch and briefly describe the salient features of shaft spillway and side channel spillway. **(6)**

(b) Design a suitable cross drainage work for the given data at the crossing of a canal and a drainage. **(17 1/3)**

RL of bed of drainage = 520.00 m

High Flood Level of drainage = 523.00 m

High Flood Discharge in drainage = 300 cumec

RL of ground = 525.00 m

RL of bed of canal = 524.50 m

Full Supply Discharge in canal = 30 cumec

Full Supply level in canal = 526.2 m

Bed width of canal = 22.0 m

Depth of water in canal = 1.70 m

Trapezoidal Canal Section with 1.5 H: 1V

Determine (i) Drainage waterway (ii) Canal waterway (iii) Bed levels at different sections.

L-4/T-2/WRE **Date: 01/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2017-2018

Sub: **WRE 435** (Hydraulic Structures)

Full Marks: 210 Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

The symbols and notations have their usual meanings.

1. (a) Briefly explain the factors governing the selection of a particular type of dam. **(7)**

   (b) Describe how the hydrodynamic pressure resulting from earthquake force is considered in the design of a gravity dam. **(8)**

   (c) The section of a non-overflow portion of a gravity dam built of concrete is shown in Figure 1. Considering the wave forces (h_w=0.80m) and neglecting earthquake forces, calculate (i) the major principal stresses at toe, and (ii) the intensity of shear stress on a horizontal plane near toe. Assume unit weight of concrete as 24 kN/m^3. Check the factor of safety against sliding (μ=0.70). **(20)**

2. (a) Explain the types and functions of flood-mitigation reservoirs with sketch. **(7)**

   (b) Mention the salient features of shaft spillway. Schematically show the possible flow conditions in a shaft spillway. **(8)**

   (c) Explain the consequences if the overflowing water breaks contact with the overflow spillway surface. **(5)**

   (d) They yield of water in Mm^3 from a catchment area during each successive month is given below: **(15)**

Month	1	2	3	4	5	6	7	8	9	10	11	12
Yield	1.4	2.1	2.8	8.4	11.9	11.9	7.7	2.8	2.52	2.24	1.96	1.68

   Determine the minimum capacity of a reservoir required to allow the above volume of water to be drawn off at a uniform rate assuming that there is no loss of water over the spillway. Apply any suitable approach.

3. (a) Describe energy dissipation mechanisms when the tail water curve lies below the y_2 curve at all discharges. Draw neat sketch of a standard stilling basin. **(7)**

   (b) Explain the effect produced by tension cracks in concrete gravity dam. Mathematically show how it should be taken care during the design phase. **(8)**

   (c) Given the ogee spillway in Figure 2 with a coefficient of discharge of 3.8, find the total force of the water on the curved section AB. Assume no loss of energy and neglect approach velocity. Given, γ_w = 62.4 lb/ft^3. **(20)**

Contd P/2

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4. (a) Draw a neat sketch showing different storage zones of a reservoir. **(5)**

(b) Explain the salient features in the hydraulic design of fully flowing box culvert. **(8)**

(c) Derive the formula to compute discharge passing through the bridge openings. Consider that the afflux is higher than one fourth of the downstream depth. **(10)**

(d) A multi span bridge is to be constructed in an alluvial river with Q = 50 m^3/s, d_{50} = 0.01 cm. Determine: (i) linear waterway of the bridge, (ii) normal depth of scour, (iii) maximum depth of scour, and (iv) depth of bridge foundation. **(12)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable values when necessary.

5. (a) What are the main causes of failure of hydraulic structures constructed on permeable foundation and what remedial measures are taken to prevent them? **(8)**

(b) Differentiate between Bligh's creep theory and Khosla's seepage theory. **(7)**

(c)The concrete floor of a head regulator is level with the channel bed (except for the short crest bumb) and is b=13 m long. The floor is provided with cut off walls at its upstream and downstream ends. The depth of upstream cutoff is 1.5 m (below the floor level) and that of the downstream wall is 2.0 m. Using Khosla's theory (see figure 3 for definition, sketch and formula), determine the thickness of the floor at its mid-length and also at its junction with the upstream and downstream cut off walls. The floor thickness may not be less than 30 cm anywhere. The upstream FSL is 1.5 m above the floor level. If the permissible exit gradient is 0.18, is the floor safe against failure by piping? **(20)**

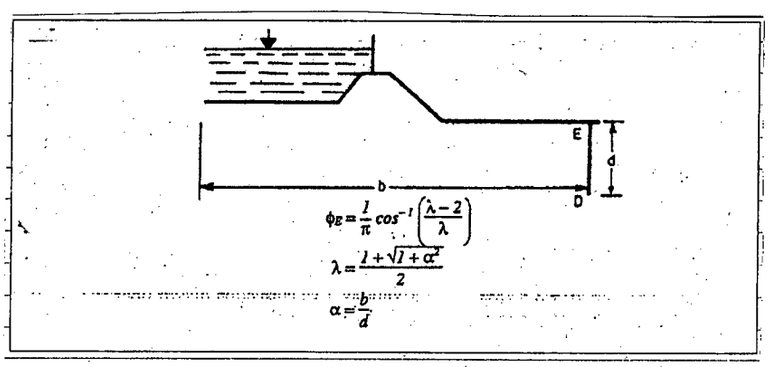

Figure: 3 for Question 5(c)

WRE 435

6. (a) Write down the classification of weirs and differentiate between a weir and a barrage. **(13)**

(b) A barrage is to be constructed on an alluvial river having a flood discharge of 8100 cumec. The relevant data are as follows: **(22)**

Average bed level of the river	257.0 m
High Flood Level (before construction of barrage)	262.2 m
Permissible afflux	1.0 m
Pond level	260.6 m

Lacey silt factor = 1

Determine (i) the crest level of under sluices and barrage bays; (ii) the waterway to pass the flood discharge; (iii) downstream floor level for under sluices portion considering a retrogression of 0.5 m and 20% discharge concentration.

7. (a) Sketch typical layout of diversion headworks showing all components. **(5)**

(b) Explain principles of slit control with references to different types slit regulation work. **(10)**

(c) What is divide wall? What are the functions of divide wall? **(8)**

(d) Determine required waterways for a canal head regulator for barrage design. The following data and figure 4 for the off-taking canal are also given: **(12)**

Full supply discharge of canal = 180 cumecs

$C_{d1} = 0.577$

$C_{d2} = 0.8$

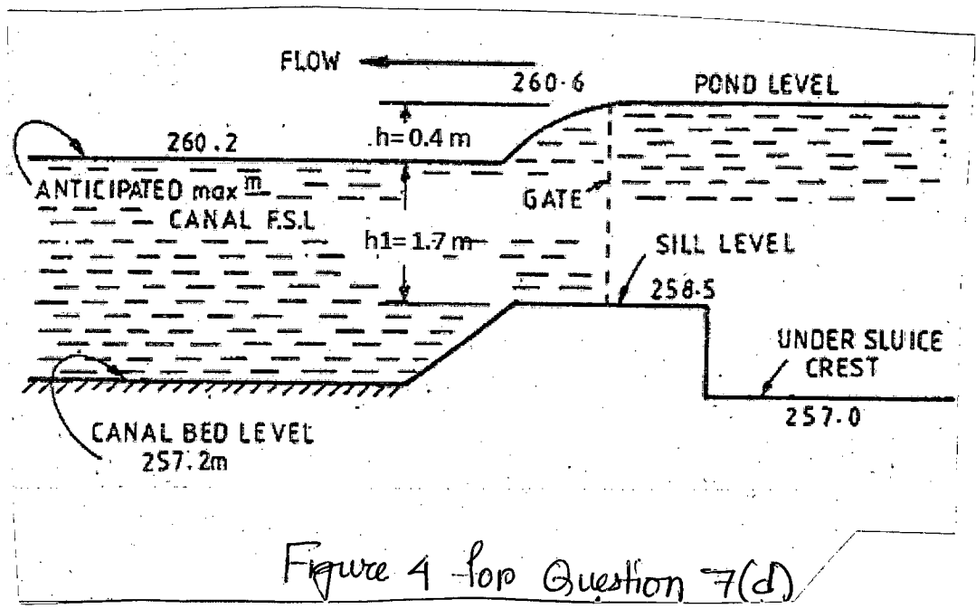

Figure 4 for Question 7(d)

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8. (a) Which cross drainage work is suitable for the following data at the crossing of a canal and drainage. **(15)**

Canal	Drain
Flow rate = 30 cumec	High flood discharge = 250 cumec
Bed width = 30 m	High flood level = 247.50 m
Depth of water = 1.5 m	High flood depth = 2.5 m
Full supply level = 251.50 m	General ground level = 251.00 m

Design (i) Waterways; (ii) Contraction and expansion transitions; (iii) Trough. Given, length and width of flumed rectangular portion of canal are 74.5 m and 10 m respectively.

(b) Write short notes with neat sketches on: **(12)**

(i) Superpassage

(ii) Level Crossing

(iii) Type II Aqueduct

(c) Under what circumstances you will recommend the use of following cross drainage works: **(8)**

(i) Syphon;

(ii) Inlet-outlet

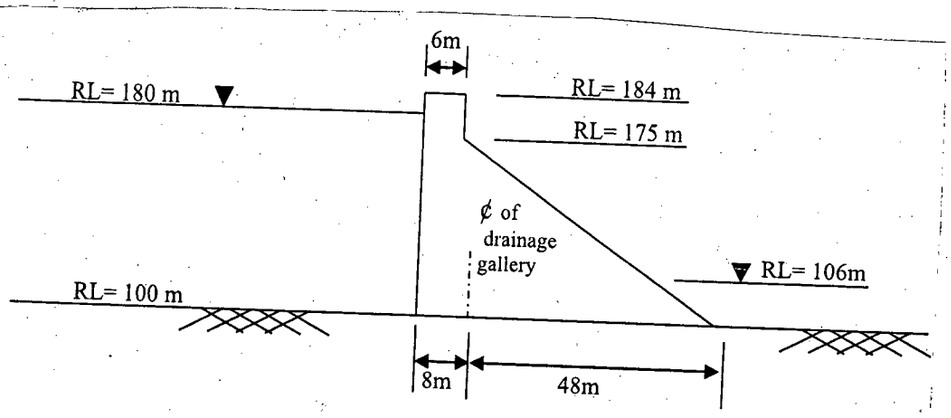

Figure 1 for Question 1 (c)

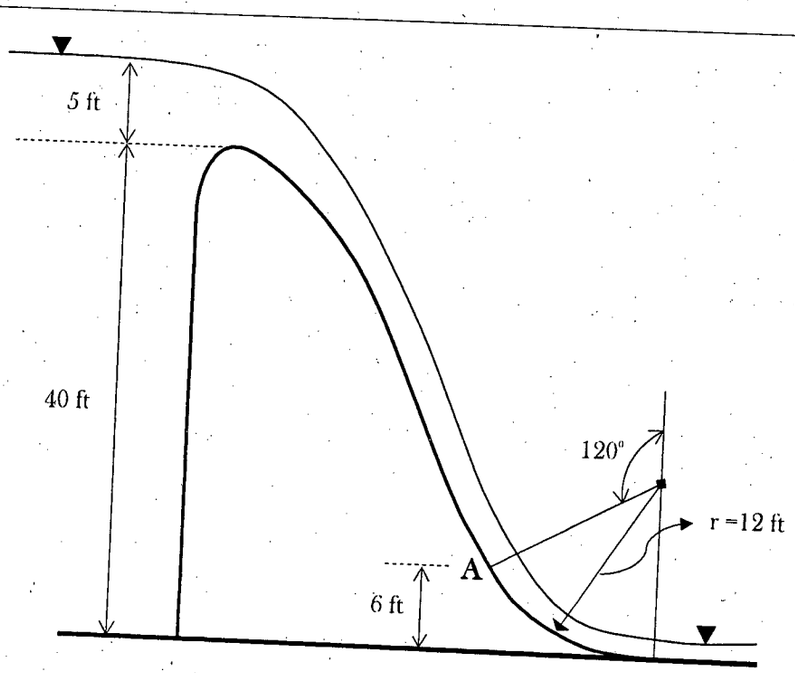

Figure 2 for Question 3 (c)

L-4/T-2/WRE **Date : 11/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B.Sc. Engineering Examinations 2016-2017

Sub : **WRE 437** (Coastal Engineering)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) "Coastal Engineering" is an important subject not only for the development coastal area of Bangladesh but for the whole country – explain. **(6)**

   (b) Discuss the similarity and assymilarity among the subjects "Oceanography", "Ocean Engineering" and "Coastal Engineering". **(6)**

   (c) "The Nation's stake in the uses of the sea is synonymous with the promise and the threat of tomorrow" – explain. **(5)**

   (d) Secondary coasts are shaped primarily by marine agents or by marine organisms – list up the major types of secondary coasts. **(10)**

   (e) Draw a typical coastal beach profile and identify all the zones. **(8)**

2. (a) Define: (i) Wave length, (ii) Wave steepness, (iii) Irregular waves, and (iv) Deep water wave. **(10)**

   (b) What are the assumptions to derive "small amplitude surface wave" theory? Why most of the time this theory is used in the design of nearshore coastal water. **(8)**

   (c) A wave with a period of 5 seconds is propagated shoreward over a uniformly sloping shelf from a depth of 375.0 m to a depth of 3.75m. Find the wave celerity and wave length at depth of (a) 375.0 m, and (b) 3.75 m. **(8)**

   (d) What is the significance of the equation $C = \sqrt{\left(\frac{gL}{2\pi}\right) tanh \frac{2\pi d}{L}}$ in water wave theory? **(4)**

   (e) Show the changes in value of (kd) and tanh(kd) when a wave travels from deep water through transitional water to the shallow water. **(5)**

3. (a) Draw the water particle displacements from mean position for shallow-water and deep-water waves. **(6)**

   (b) Define subject-surface pressure. Both the static and dynamic component of pressure has contribution in the total pressure, show with the equation and figure. **(5)**

   (c) List up the factors affecting 'sea level rise' and 'seiches in harbor.' **(7)**

   (d) Write short notes on the following terms: (i) Shoaling, (ii) Wave run up, and (iii) Wave breaking **(9)**

   (e) Given a wave with a period T = 5 sec in water depth d = 17.5 m and wave height 1.5 m. Find the local horizontal and vertical velocities at a depth of 4 m below SWL when $\theta = 2\pi x/L - 2\pi t/T = \pi/5$. **(8)**

Contd P/2

WRE 437

4. (a) What are the significance of the dimensionless terms in the design of vertical piles. **(5)**

(b) Draw the Miche-Rundgreen wave condition at a structure and seaward of a structure when no reflection occurs for non-breaking wave condition on a vertical wall. **(6)**

(c) Define an estuary? Illustrate estuary based on geologic features and convergence on estuary side (no figures). **(9)**

(d) Write down the classification of wave forces problems based on the type of wave action and by the type of the structure. **(5)**

(e) Find the non breaking wave force and moments against a completely reflecting vertical wall ($\chi = 1.0$) resulting from the wave condition given below: **(10)**

(i) wave height at the structure (if the structure were not there) $H_i = 2.20$ m.

(ii) depth at structure, $d = 4.50$ m

(iii) the wave period considered in the design is $T = 6.0$ sec

Figure 1, Figure 2 and Figure 3 are attached for relevant uses.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Assume the reasonable value of any data if not given.

5. (a) Define the flowing terms: Dry dock, Chart datum, Tidal flow, Beach nourishment, Free port, Neap tide and Tsunami. **(7)**

(b) State the guiding factors in the choice of a harbor site. What are the role of following processes in harbor layout and suggest remedies: **(4+10)**

(i) Littoral drift

(ii) Wind waves

(iii) Tidal currents

(iv) Winds

(v) Siltation and erosion

(c) Explain the Newton's static theory of tide generation and justify the statement "The moon has a more pronounced effect in generating tides than the sun". Also describe the dynamical theory of tide generation. **(14)**

6. (a) Write down the physical characteristics of tsunami. **(7)**

(b) Describe the procedure of estimating the storm surge height in a continental shelf for static wind field and moving wind field with triangular wind velocity. **(14)**

(c) Explain (i) prediction and early warning system of a tsunami **(7+7)**

(ii) tidal characteristics of Bangladesh

Contd P/3

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7. (a) State the physical and functional characteristics of the following coastal structures: **(7)**
   (i) detached breakwater
   (ii) seawall

   (b) With neat sketches, show the typical design section of **(14)**
   (i) vertical composite caisson breakwater
   (ii) rubble-mound breakwater with concrete superstructure
   (iii) vertical front seawall
   (iv) revetment toe protection.

   (c) For a vertical wall of 6.5 m height sited in sea water with d_s = 3 m on a bottom slope of 1:25 and experiencing wave crests at an interval of 8 sec. The breaking wave height is 3.5 m, the breaking depth is 4 m and the wave length is 90 m. Determine the horizontal wave force per unit length of the wall. Use the following equations. **(14)**

$$P_1 = (\alpha_1 + \alpha_2)\gamma_w H_b \qquad \alpha_1 = 0.6 + \frac{1}{2}\left[\frac{4\pi h/L}{\sinh(4\pi h/L)}\right]^2$$

$$P_3 = \alpha_3 P_1 \qquad \alpha_2 = \min\left[\left(\frac{h_b - d}{3h_b}\right)\left(\frac{H_b}{d}\right)^2, \frac{2d}{H_b}\right]$$

$$P_4 = \left(1 - \frac{h_c}{1.5H_b}\right)P_1 \qquad \alpha_3 = 1 - \frac{d_s}{h}\left[1 - \frac{1}{\cosh\left(\frac{2\pi h}{L}\right)}\right]$$

8. (a) State the mechanism and also show with neat sketches of the following failures in coastal structures: **(15)**
   (i) hydraulic instability and breakage of armor unit of breakwater
   (ii) pressure blowout of slab elements of revetment
   (iii) toe instability on hard bottoms.

   (b) The site and wave conditions along a coastal shore line are as below: **(20)**

RL of the Road level = +25 ft MLLW
Storm surge height = 6 ft
50 year high water level = +10 ft MLLW
MHHW = +8 ft MLLW
Bed level at the end of bank slope = +5.0 ft MLLW
Bottom slope of sea bed = 1:15
Design wave height = 6 ft
Design wave period = 5 sec.

Design a revetment type shore protection structure including the filter and toe protection with a suitable type armor unit. Also show the design section with neat sketch. (Use the attached Table 2.2, 2.3, 2.4) and graph (Figure 4). Assume the reasonable value of any data if not given).

WRE437 = 42

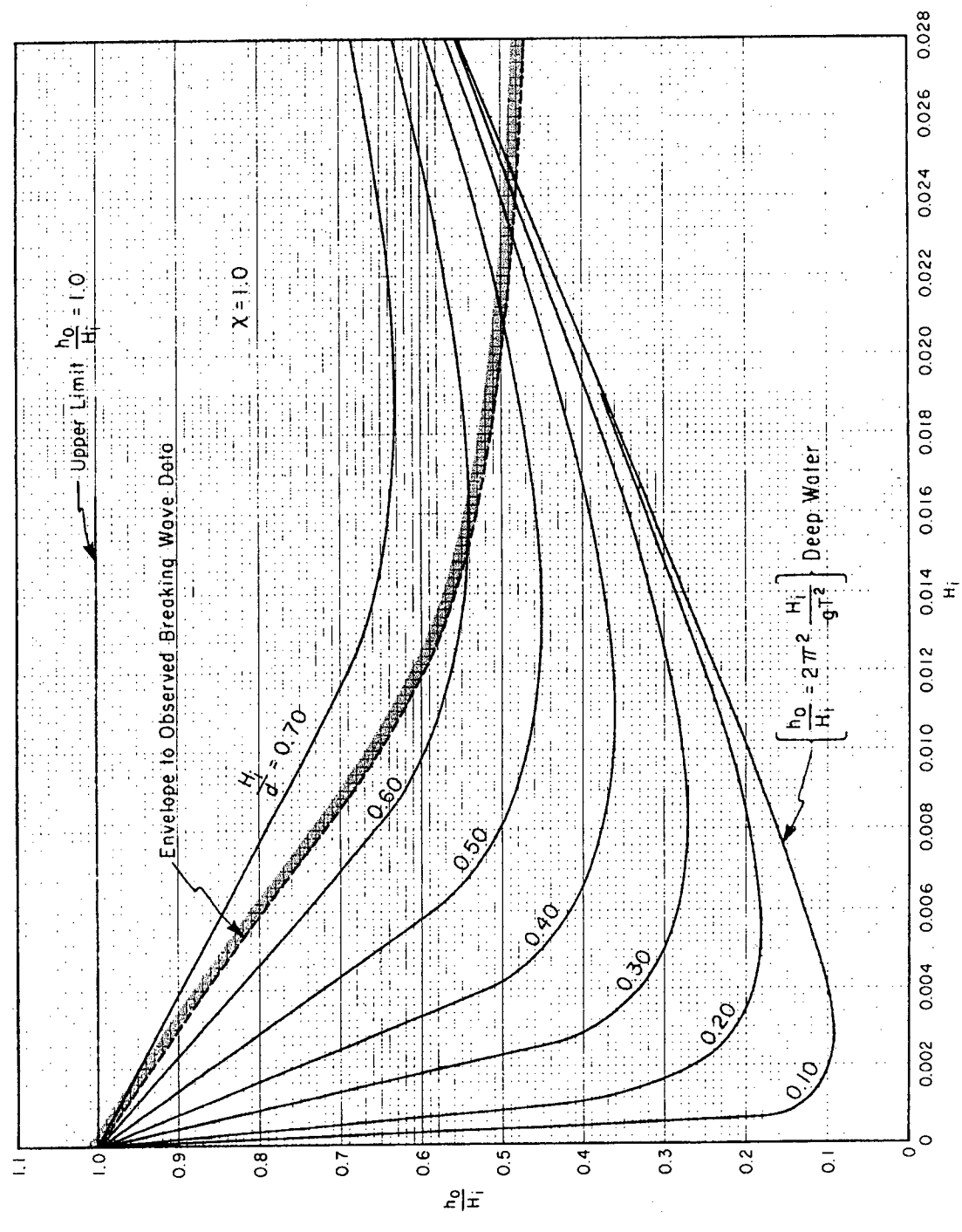

Figure 1 Nonbreaking waves; $\chi = 1.0$.

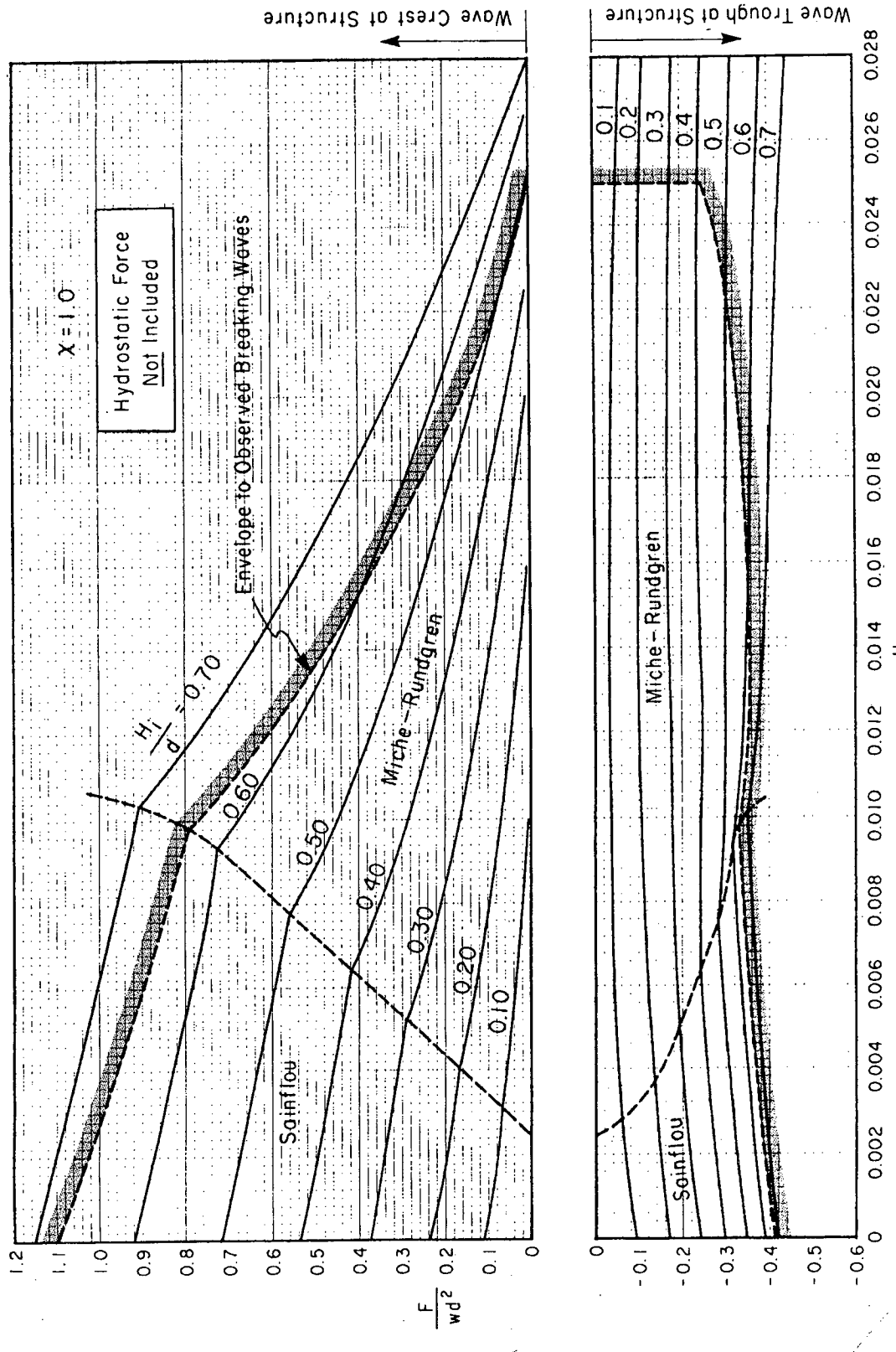

Figure 2 Nonbreaking wave forces; $\chi = 1.0$.

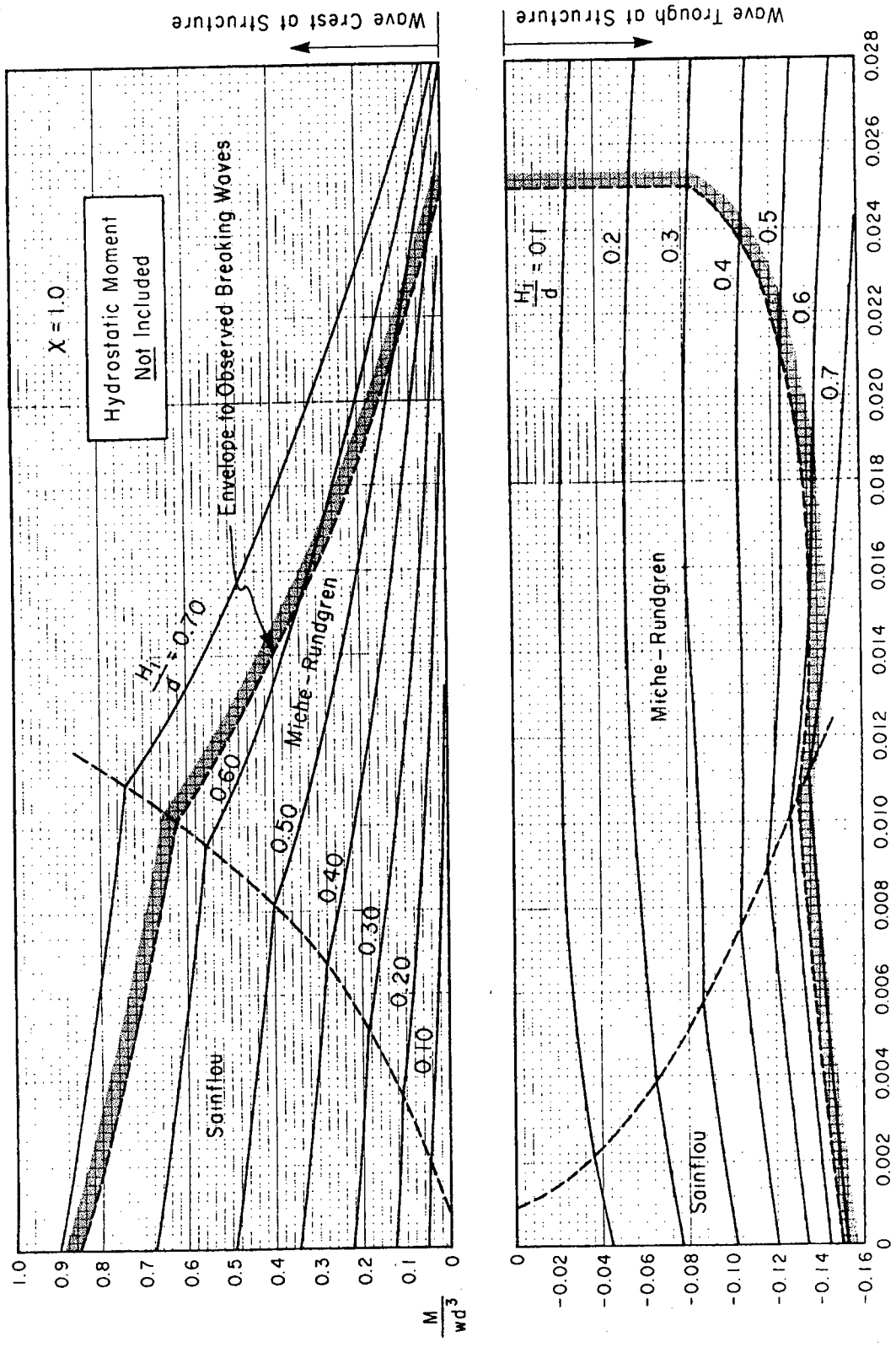

Figure 3 Nonbreaking wave moment; $\chi = 1.0$.

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Table 2-2
Rough Slope Runup Correction Factors (Carstea et al. 1975b)

Armor Type	Slope (cot θ)	Relative Size H / K_r[a,b]	Correction Factor r
Quarrystone	1.5	3 to 4	0.60
Quarrystone	2.5	3 to 4	0.63
Quarrystone	3.5	3 to 4	0.60
Quarrystone	5	3	0.60
Quarrystone	5	4	0.68
Quarrystone	5	5	0.72
Concrete Blocks[c]	Any	6[b]	0.93
Stepped slope with vertical risers	1.5	$1 \le H_o'/K_r$[d]	0.75
Stepped slope with vertical risers	2.0	$1 \le H_o'/K_r$[d]	0.75
Stepped slope with vertical risers	3.0	$1 \le H_o'/K_r$[d]	0.70
Stepped slope with rounded edges	3.0	$1 \le H_o'/K_r$[d]	0.86
Concrete Armor Units			
Tetrapods random two layers	1.3 to 3.0	-	0.45
Tetrapods uniform two layers	1.3 to 3.0	-	0.51
Tribars random two layers	1.3 to 3.0	-	0.45
Tribars uniform one layer	1.3 to 3.0	-	0.50

[a] K_r is the characteristic height of the armor unit perpendicular to the slope. For quarrystone, it is the nominal diameter; for armor units, the height above the slope.
[b] Use H_o' for $d_s/H_o' > 3$; and the local wave height, H_s for $d_s/H_o' \le 3$.
[c] Perforated surfaces of Gobi Blocks, Monoslaps, and concrete masonry units placed hollows up.
[d] K_r is the riser height.

Table 2-3
Suggested Values for Use in Determining Armor Weight (Breaking Wave Conditions)

Armor Unit	n[1]	Placement	Slope (cot θ)	K_D
Quarrystone				
Smooth rounded	2	Random	1.5 to 3.0	1.2
Smooth rounded	>3	Random	1.5 to 3.0	1.6
Rough angular	1	Random	1.5 to 3.0	Do Not Use
Rough angular	2	Random	1.5 to 3.0	2.0
Rough angular	>3	Random	1.5 to 3.0	2.2
Rough angular	2	Special[2]	1.5 to 3.0	7.0 to 20.0
Graded riprap[3]	2[4]	Random	2.0 to 6.0	2.2
Concrete Armor Units				
Tetrapod	2	Random	1.5 to 3.0	7.0
Tripod	2	Random	1.5 to 3.0	9.0
Tripod	1	Uniform	1.5 to 3.0	12.0
Dolos	2	Random	2.0 to 3.0[5]	15.0[5]

[1] n equals the number of equivalent spherical diameters corresponding to the median stone weight that would fit within the layer thickness.
[2] Special placement with long axes of stone placed perpendicular to the slope face. Model tests are described in Markle and Davidson (1979).
[3] Graded riprap is not recommended where wave heights exceed 5 ft.
[4] By definition, graded riprap thickness is two times the diameter of the minimum W_{50} size.
[5] Stability of dolosse on slope steeper than 1 on 2 should be verified by model tests.
[6] No damage design (3 to 5 percent of units move). If no rocking of armor (less than 2 percent) is desired, reduce K_D by approximately 50 percent.

Table 2-4
Layer Coefficients and Porosity for Various Armor Units

Armor Unit	n	Placement	K_Δ	P (%)
Quarrystone (smooth)	2	Random	1.00	38
Quarrystone (rough)	2	Random	1.00	37
Quarrystone (rough)	≥3	Random	1.00	40
Graded riprap	2[a]	Random	N/A	37
Tetrapod	2	Random	1.04	50
Tribar	2	Random	1.02	54
Tribar	1	Uniform	1.13	47
Dolos	2	Random	0.94	66

[a] By definition, riprap thickness equals two cubic lengths of W_{50} or 1.25 W_{100}.

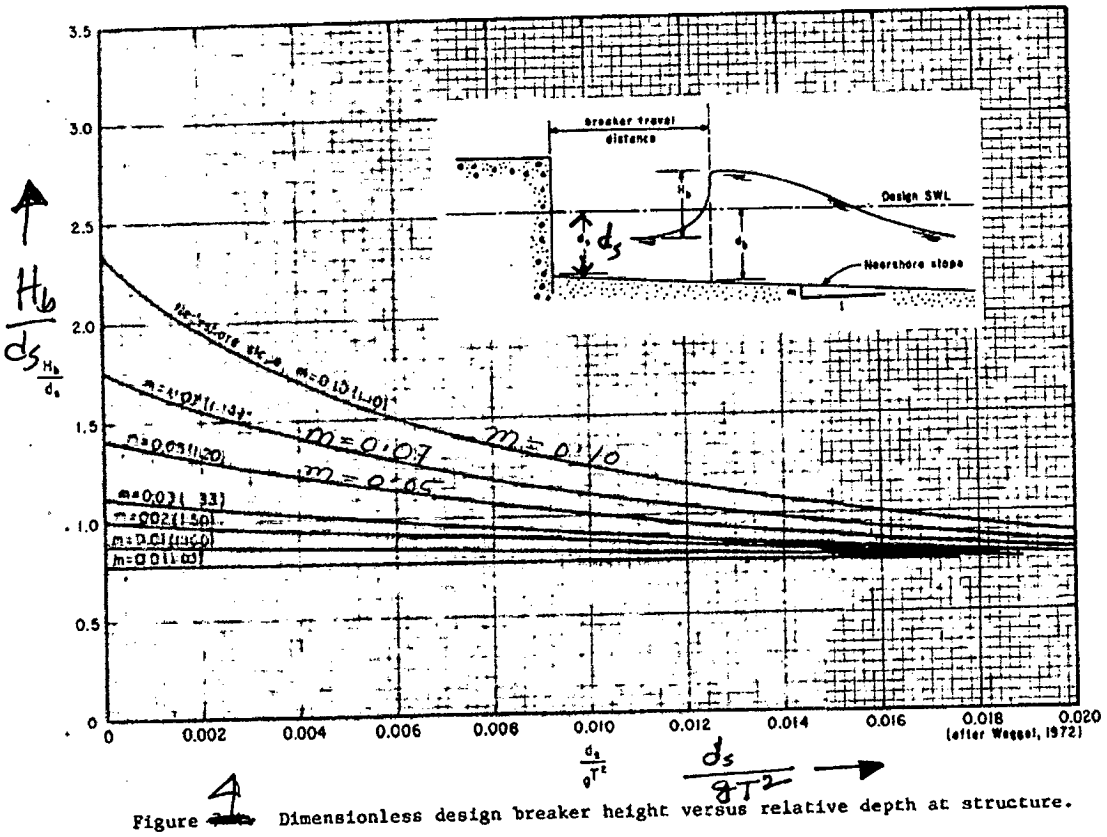

Figure 4 Dimensionless design breaker height versus relative depth at structure.

L-4/T-2/WRE **Date : 17/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B.Sc. Engineering Examinations 2016-2017

Sub : **WRE 423** (River Engineering and Flood Mitigation)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.
Assume reasonable data if not given. Sketch whenever necessary.

1. (a) Define the following terms used in River Engineering: **(15)**
   (i) Channelization
   (ii) River regime
   (iii) Median size of bed material
   (iv) Sediment discharge
   (v) Beneficial use of dredged materials

   (b) Distinguish between 'River Engineering' and 'River Management'. **(10)**
   "The Engineers' view of river basin is a series of hydraulic problems"- answer with sketches.

   (c) Enumerate the six basic concepts that should be considered when working with river basin. **(4)**

   (d) Give a classification of River channels with its various characteristics. **(6)**

2. (a) How you will determine the longitudinal slope of river? **(10)**
   Express the idealized longitudinal profile of a river as an exponential decay function in (x, z) plane. Given that S_0 is the initial slope and α is a slope reduction coefficient.

   (b) Estimate the transverse gradient of a 500 m wide river at the bend of radius 1 km and discharge 10000 m^3/s. Sketch the streamlines and surface velocity along the channel length and across the width of a meander reach. **(15)**

   (c) Name the different types of sediment load. Also draw a typical diagram showing the threshold velocity of each type of sediment particles. **(10)**

3. (a) Derive the expression of shear stress acting on channel boundary. Calculate the minimum depth required for a wide channel with longitudinal slope 0.0004 and bed particle size 0.22 mm. Assume reasonable data if required. **(10)**

   (b) Following hydraulic data are given for the design of a bridge foundation. **(15)**
   - Discharge: 2000 m^3/s
   - Average width: 200 m
   - No. and length of span = 6 @ 25 m length
   - Pier diameter = 2.0 m
   - Approaching flow depth: 6 m
   - Bed material size = 0.10 mm

   Estimate the total scour depth.

   (c) Write briefly about the following with sketches: **(10)**
   (i) General and local scour
   (ii) Confluence and bifurcation.

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WRE423

4. (a) Sketch a typical bank protection revetment works and show its various components. **(5)**

(b) Following data are given for a river. **(15)**

- Design discharge = 50,000 m^3/s
- Highest flood level = 10.5 m PWD
- Design velocity = 3.5 m/s
- Average water level = 6.5 m PWD
- Low water level = 2.0 m PWD
- Bed material size = 0.15 mm

Design river bank revetment works. Draw the design layout with dimension. Assume reasonable data/values for your design, if not given.

(c) Design a navigation channel for a 2000 ton cargo vessel. Answer with sketch and dimension. Assume reasonable value if not given. **(15)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. (a) What are the different types of flood in Bangladesh? Describe the main causes of flood in Bangladesh. **(12)**

(b) Discuss how channel improvement and watershed management can reduce flood damages? **(13)**

(c) Briefly describe how flood risk analysis is carried out. **(10)**

6 (a) What are the objectives of seepage analysis of earthen embankment? Explain some seepage mitigation measures. **(12)**

(b) Classify groynes according to the action on stream flow. Show the effect of groynes on river with neat sketch. **(10)**

(c) What are the direct and indirect damages of flood? Discuss different ways to measure flood damages? **(13)**

7. (a) What are the different flood zones? How flood zoning can be effective in reducing flood control damages? **(10)**

(b) What do you understand by flood proofing? Discuss different flood proofing methods briefly. **(13)**

(c) What are the causes of embankment failure? **(5)**

(d) Discuss the role of flood forecasting in flood management with its limitation. **(7)**

Contd P/3

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8. (a) Describe various Flood Action plans that have been implemented in Bangladesh. **(10)**

(b) Discuss the causes and impacts of urban flooding. What measures can be taken to mitigate urban flood damage? **(13)**

(c) Construction of a levee is under consideration for a reach of river vulnerable to flood damages. The estimated damages from various river stages and the cost of levee are given below. The return periods of the flood stages 6.4, 7.0, 7.6, 8.2, 8.8, 9.4 and 10.0 m are 10, 15, 22, 30, 70, 150 and 300 years respectively. What river stage would you recommend for the design of the levee? **(12)**

Peak Stage (m)	Total damage below indicated stage (Million TK)	Project cost (Million TK)
6.1	0	40
6.7	300	60
7.3	1000	80
7.9	2000	100
8.5	3200	130
9.1	4500	160
9.7	6000	180
10.3	8000	200

L-4/T-2/WRE **Date: 23/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2016-2017

Sub: **WRE 421** (Professional Practice and Communications)

Full Marks: 210 Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define Engineering. What is the importance of professional registration for an Engineer? **(6)**

   (b) List the activities of different specialists in an Engineering team. **(6)**

   (c) Why is public trust important in professional practice? **(6)**

   (d) Discuss the key factors in the management of professional practice. **(17)**

2. (a) Describe how Engineers are accountable to multiple constituents. **(6)**

   (b) List the role and responsibilities of a professional in the society. **(6)**

   (c)List the importance of effective writing for Engineers. **(6)**

   (d) "Professional engineers shall conduct themselves with integrity, honesty, fairness and objectivity in their professional activities" — Discuss this statement. **(17)**

3. (a) Discuss briefly the components for the management of technical quality of professionals. **(6)**

   (b) What steps does an Engineer follow to ensure that they comply with applicable statutes, regulations and bylaws in their professional practices? **(6)**

   (c) What are key factors in effective presentation? **(6)**

   (d) List the salient features of the code of ethics of Institute of Engineers, Bangladesh. **(6)**

   (e) Discuss the different elements that must be present for a contract to be binding and enforceable. **(11)**

4. (a) Briefly describe the guidelines of conducting an official meeting. **(6)**

   (b) List the causes of possible contractual problems. **(6)**

   (c) List the documents that may be needed for submitting a claim. **(6)**

   (d)Make a comparison between settlement of contractual problem through arbitration and court action. **(6)**

Contd P/2

WRE 421

Contd... Q. No. 4

(e) "A consulting company, LMN Engineering Inc., was awarded an assignment to design a drilling program, interpret data, evaluate the potential of the field, and prepare a report for use by a client to raise capital from the public. The company president, Cy Smick, P.Engg., assumed both corporate and professional responsibility for the professional practice of the company. He maintained custody of the permit stamp and only he was authorized to affix and sign it before completed documents were issued. **(11)**

The assignment came at a time when the company was extremely busy, Mr. Smick assigned Dee S. Covey, P.Engg., to direct and control the project. However, she was not able to devote as much attention to the assignment as she believed was needed to provide an adequate level of professional direction.

When it was completed, Ms. Covey discussed the report with Mr. Smick. Although she believed that the project staff had performed their respective duties responsibly and well, Ms. Covey expressed concern that she had not been able to properly supervise the work. She explained that for this reason she had not affixed her professional stamp to the final report. The president accepted this explanation and, without further review, affixed and signed LMN's permit stamp to the report and mailed it to the client.

The report was accepted and used to develop a prospectus for distribution to potential investors. Several years later, an error was discovered in the report, which had the effect of overstating the investment potential by a factor of three.

The client sued LMN and named Smick and Covey in the lawsuit. One of the investors complained to the Regulatory body."

(i) Who should bear the major responsibility for the error that precipitated the lawsuit — LMN's president or the Ms. Covey?

(ii) What could Ms. Covey have done to avoid such a situation?

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) In a neat flow diagram, show the sequential steps of a project. **(8)**

(b) Explain the various types of professional drawings utilized in engineering projects. **(12)**

(c) What are the different components of a typical Tender document? Summarize and explain the purposes of each component. **(15)**

6. (a) What are the pre-requisites of signing a contract document? **(5)**

(b) What are the different types of contracts? Write down the merits and demerits of each type with relevant examples. **(20)**

(c) Explain the general risks and responsibilities of a contractor. **(10)**

Contd P/3

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7. (a) What are the different ways of discharging an unsuitable contract? **(10)**

   (b) Describe in detail the different methods of selecting a contractor. **(15)**

   (c) Define the following: **(10)**

   (i) Offeror

   (ii) Offeree

   (iii) Bill of Quantities

   (iv) Form of Tender

   (v) Breach of Contract

8. (a) What purpose does the 'construction specification' serve in a contract document? **(5)**

   (b) What are the different categories of construction specifications? Explain each category with example. **(20)**

   (c) Describe the different steps involved in a bid evaluation process. **(10)**

L-4/T-2/WRE

Date: 29/09/2018

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2016-2017

Sub: **WRE 431** (Climatology)

Full Marks: 140 Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable values if any data is missing.

1. (a) Consider a leaky greenhouse with one layer of atmosphere whose absorptivity is ϵ. Derive the expression for surface temperature and air temperature in terms of the emission temperature of the earth. Mention necessary assumptions. **(5⅓)**

(b) Explain how cloud cover, land cover change and snow cover affect albedo and hence climate. **(6)**

(c) Write short notes on (i) Climate forcing; (ii) Aerosol precipitation; (iii) Representative Concentration Pathways; **(6)**

(d) (i) Write short notes on earth's radiation budget. **(6)**

(ii) Calculate the pressure on the surface of a hilly area located at an altitude of 3 km. Given the atmospheric pressure at the mean sea level is 1000 mbar and temperature 27°C.

2. (a) How ocean salinity and cryosphere influence climate? **(5⅓)**

(b) Draw the vertical thermal structure of the atmosphere showing the main zones of the atmosphere. What causes the temperature to rise or fall with height in each of these zones? **(6)**

(c) Write down the definition of aerosol and its natural and anthropogenic sources. What are the direct and indirect effects of aerosol on climate? **(6)**

(d) Determine the net radiation in South Africa in March with the following data: **(6)**

Latitude = 33.9°S, Total sunshine hours in March 350, a mean monthly daily maximum and minimum air temperature are of 35 and 22°C, vapour pressure = 2.35 kPa, Albedo = 0.25, Stefan-Boltzmann constant = 4.903×10^{-9} MJ $K^{-4}/m^2/day$, fraction of R_a reaching on the earth on overcast days = 0.2, fraction R_a reaching on the earth on clear days = 0.75. Assume reasonable values if any data is missing.

$$R_a = \frac{24(60)}{\pi} G_{sc} d_r [\omega_s \sin(\varphi)\sin(\delta) + \cos(\varphi)\cos(\delta)\sin(\omega_s)]$$

Contd P/2

WRE 431

3. (a) Write short notes on climate model parameterization and boundary condition? **(5⅓)**

(b) (i) Describe statistical and dynamic downscaling. **(6)**

(ii) Write short notes on Regional Climate Model (RCM) and mention the relative advantages and disadvantages of RCM over GCM.

(c) In a schematic diagram show the components of global climate model and explain. **(6)**

(d) For Maldives, find the maximum and minimum temperature and relative humidity on a certain day. Data available are: **(6)**

mean temperature = 28°C, extraterrestrial radiation = 25 MJ m^{-2} day^{-1}, shortwave radiation = 14 MJ m^{-2} day^{-1}.

4. (a) Describe earth's orbital parameters and their role on climate change with neat sketches. **(5⅓)**

(b) Write short notes on escape velocity and molecular velocity. Compute the escape velocity and molecular velocity of Helium in the earth. Will this gas escape from the atmosphere of the earth? **(4)**

(c) Consider a simple greenhouse with two layer of atmosphere with temperature T_1 in the upper layer and T_2 in the bottom layer. Assume the upper and bottom layer of atmosphere absorbs 0.2 ∂T_e^4 and 0.3 ∂T_e^4, respectively and the surface absorbs 0.5 ∂T_e^4. Write down the energy balance equations at (i) the surface, (ii) atmospheric layer and (iii) top of the atmosphere. **(7)**

Also compute T_1, T_2 and surface temperature in terms of emission temperature of the earth. Also assume, earth surface has an emissivity of one (blackbody) and atmosphere is completely opaque to infrared radiation (i.e. $\varepsilon = 1$).

(d) Air with a temperature of 28°C moves across a catchment at a speed of m/s. The catchment is wet and the air is just at saturation. The isolation is 700 W/m^2 and downward longwave radiation at the ground is 350 W/m^2. The longwave emissivity of the surface is 0.95 and the albedo of the surface is 0.1. What will be surface temperature in equilibrium? Given, air density = 1.2 kg/m^3 and $C_D = 2 \times 10^{-3}$, Cp = 1004 J/kg/K, latent heat flux = 3.5 × sensible heat flux, Stefan-Boltzmann constant 5.67×10^{-8} W.K^{-4}/m^2. **(7)**

$$SH = c_p \rho C_D U (T_s - T_a)$$

$$\sigma T_s^4 = \sigma T_a^4 + 4\sigma T_a^3 (T_s - T_a)$$

Contd P/3

WRE 431

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is Koppen Climate Classification? State its different groups, types and subtypes. **(5)**

(b) How polar stratospheric cloud is related to ozone depletion? **(4)**

(c) Describe they way lightning strikes/. Explain Orograpic Lifting? **(5)**

(d) Define (i) Climate Change, (ii) Cumulonimbus Cloud, (iii) Peru Current, (iv) Arctic and Antarctic Ozone Hole. **(5)**

(e) Discuss the role of CO_2 as Greenhouse Gas. Compare the impact of CO_2 and CFC on global warming. **(4⅓)**

6. (a) What is photochemical smog? How it causes harmful effects? **(5⅓)**

(b) "El-Nini episodes are linked to droughts in Indonesia and Australia" — Explain with figure. **(3)**

(c) Name different cloud types along with their respective groups. Describe *'Stratus'* cloud group. **(7)**

(d) Explain buffer with respect to acid rain. Also state the causes and effects of acid rain. **(8)**

7. (a) Compare the effects of different UV radiations. **(3)**

(b) Define ENSO. How it is related to a notable flood in Bangladesh? Discuss the causes of 2004 flood event. **(6⅓)**

(c) Describe the 1970 and 1991 cyclones in Bangladesh. Compare the losses of those to recent cyclones. **(3)**

(d) Explain how the atmospheric inversion can eventually lead to air pollution. **(3)**

(e) Differentiate the controlling factors and distinguishing characteristics of *Dry arid climate and Dry semiarid climate*. **(6**

(f) Explain how the ozone depletion can adversely affect the primary productivity in the oceans. **(2)**

8. (a) Briefly explain the southwest monsoon. **(3)**

(b) What is paleoclimatology? Describe the circulation by "the great ocean conveyor". **(4⅓)**

(c) Explain why normal flood during rainy season is essential in ensuring production of HYV rice during dry season in Bangladesh. State some human induced causes of flood. **(5)**

(d) "Hurricanes have been linked to La-Nina episodes" – which region is indicated here? Explain with proper figure. **(3)**

(e) Define Doldrums. Differentiate between Tundra Climate and Icecap Climate. **(5)**

(f) What is the advantage of HCFC over CFC regarding Ozone depletion? **(3)**
