BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environmental, Water Resources, and Coastal Engineering, Term Final (Spring) Examination 2025: Oct - Nov 2025

Student Group: Earned Credit Hours >180

Subject: EWCE 461, River Engineering and Flood Management

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** out of the remaining **THREE** questions 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. Define an alluvial river. Write down the characteristics of classifying river pattern and the patterns based on their characteristics. **05**

b. For any given discharge the river pattern changes with the increase in slope- explain with a figure. **05**

c. Explain briefly two hypotheses proposed for the formation of meanders. **05**

d. Classify sediment load on the basis of physical nature. Explain briefly the difference between suspended bed material load and suspended load. **05**

e. Define 'form roughness'. Write down the major differences between the upper and lower flow regimes. **05**

f. Explain with figures how the sediment size and angle of attack affect the pier scour. **05**

Question 2

a. Explain with a figure how the width-depth ratio of a river depends upon the cohesiveness of bank and bed material. **05**

b. Define a flashy river with a figure. Explain how the velocity is affected as the discharge of a river increases downstream. **06**

c. Describe the parameters considered in determining the relative stability of rivers. Which river pattern is more stable and why? **06**

d. Explain with a figure how the size and concentration of suspended sediment vary with depth. What is the approximate shape of the profile and why? **05**

e. The velocity required to initiate erosion of bed material of a river is 0.62 m/sec. If the Shield's parameter of the bed materials (d_{50}) is 0.032 and Chezy's C is 32, then calculate the size of the bed material. What is the textural classification of the sediment? **08**

Question 3

a. Show in a figure how the difference in velocity between erosion and deposition of sediment changes with the increase in sediment size. **06**

b. Explain the expected morphological changes in a river: (1) upstream and downstream of a dam (2) downstream of diversion for water supply (3) increase in discharge due to flood. **08**

c. A river with a width of 60m and discharge of 248 m^3/sec runs with a slope of 0.05%. If the sediment concentration at 0.2 m from the river bed is 400 ppm then determine the concentration at 1m. The Chezy's C is 32 and the d_{50} is 0.5 mm. Assume any other data as necessary. **16**

Question 4

a. Describe briefly the process of scour around bridge pier. Explain why the abutment scour depth is generally less than that of a pier. **08**

b. Show the components of a complex pier using a figure and explain how complex pier scour depth is estimated. **05**

c. Explain briefly: (i) Sacrificial pile (ii) Spur and Bandal (iii) Capital dredging (iv) Helical current. **08**

d. Calculate the equivalent pier diameter for a 110 m wide river with a discharge of 380 m^3/sec (slope of 0.032% and Manning's n is 0.025). The width of the normal pier is 1.0 m and the pile cap width is 4.2 m and to be placed at the river bed level. **09**

SECTION-B

Question 5 (Compulsory)

a. Write short notes on- **3×2=06**

(i) Flood wall and Levee
(ii) Gravity dam
(iii) Diversion dam

b. A floodplain community faces four classes of flood events. Historical analysis gives the following return periods and the estimated monetary damages if each event occurs at today's prices. **08**

Flood Class	Return Period (years)	Damage (million TK)
Frequent	10	8
Moderate	20	15
Severe	50	35
Extreme	100	70

A proposed embankment project in the floodplain is expected to-

(i) reduce damages by 50% for 10 and 20-year floods

(ii) reduce damages by 25% for 50-year flood
(iii) has no effect on the 100-year flood

Analyze and calculate the flood risk associated with the floodplain community for both scenarios (with embankment and without embankment). Also calculate the annual risk reduction (benefit) if embankment project is implemented.

c. Briefly describe the planning for flood management. **08**

d. Briefly explain the effect of land use change on flood hazards. **08**

Question 6

a. Briefly explain the Geographic and Hydro-meteorological factors responsible for floods in Bangladesh. **10**

b. Define flood forecasting. Illustrate the role of flood forecasting in flood management. **10**

c. Briefly describe the consideration to develop a flood proofing strategy. **10**

Question 7

a. Define Urban Flooding. Briefly explain the impacts of Urban Flooding. **10**

b. List down the factors on which damages from a flood event depend. Briefly describe the short term and long term measures for flood management. **10**

c. Briefly describe the various flood proofing strategies outlined by Federal Emergency Management Agency (FEMA). **10**

Question 8

a. Spurs not only help in bank protection but also develop a new bank line- explain with a figure. **05**

b. Explain briefly the phases involved in the dredging process. **07**

c. Explain the difference between: (a) clear water and live bed scour (b) attracting and repelling groyne (c) shear and fall velocity (d) scour and degradation. **08**

d. Explain briefly the limitations of Lane's relationship on river equilibrium. **04**

e. A 100m wide river has a depth of 3.5m at a slope of 0.25% over a gravel bed in which d_{50} is 2.5cm. Calculate the bed load of the river. **06**