BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environmental, Water Resources, and Coastal Engineering, Term Final (Spring)
Examination 2024: Oct 2024 - Nov 2024

Student Group: Earned Credit Hours >108

Subject: EWC 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. Explain three important reasons as to why the slope of a river decreases downstream. **05**

b. Define bankfull discharge. Explain with a figure why the width/depth ratio changes abruptly beyond the bankfull discharge. **05**

c. Explain with a figure how sediment size and width/depth ratio affect the river pattern. **05**

d. Explain with a figure how suspended sediment concentrations would vary with depth for d_{10}, d_{50} and d_{90} sediment sizes. **05**

e. Mention the differences between wide and narrow pier? Explain with a figure how pier width affects the scour depth. **05**

f. Explain briefly: Attracting groyne, Slack zone, Riprap and Gabbion. **05**

Question 2

a. Explain how planform stability ratios determine the stability of river. **06**

b. Show that the force required to erode larger sediment is a function of sediment diameter. **04**

c. Show pool and riffle in a figure and draw their cross sections. **05**

d. The pool to pool distance and the corresponding width of a meandering river are shown in the following table. Derive the meander length and width relationship. **15**

Table 2(d)

Pool to pool distance (m)	390	750	1100	1850	2800	3600
Width (m)	90	120	210	280	370	460

Question 3

a. Explain the differences between wash load, suspended bed material load and suspended load. **05**

b. Explain with a figure why suspended load and bed load are interchangeable. **05**

c. Explain briefly how the bedforms change with increasing stream power. Mention the reasons why bedforms of upper flow regime do not generally occur in nature. **05**

d. A 110 m wide river with a discharge of 55 m^3/sec and a slope of 0.025 % (Chezy's constant is 38) has a bed material size of 1.2 mm (Shield's parameter is 0.032). Determine whether the river bed is erodible and if so, what should be the maximum allowable discharge to make the bed stable? **10**

e. Explain with a figure how the sphericity of a sediment affects its fall velocity. **05**

Question 4

a. Define Rouse's number. Explain how Rouse's number can distinguish the suspension status of a sediment. **05**

b. Explain the complexity in the determination of suspended sediment load. **05**

c. Define a complex pier. Explain why effective pier diameter is necessary for the estimation of scour of a complex pier. **05**

d. Explain briefly the advantages of navigation compared to other modes of transport. **05**

e. A 165 m wide river with a discharge of 105 m^3/sec has a slope of 0.034 % (n = 0.025). The river has dune bedforms with length and height of 65 cm and 11 cm respectively. If the bed velocity is 25 % of the mean velocity, then estimate the bed load. Assume any other data if necessary. **10**

SECTION-B

Question 5 (Compulsory)

a. Briefly explain the consideration of a flood proofing strategy. **10**

b. Explain Geographical and Hydro-Meteorological factors responsible for floods in Bangladesh. **10**

c. Discuss about morphological and hydraulic response due to dredging. **05**

d. Define diversion channel. List down advantages and disadvantages of diversion channel for flood control. **05**

Question 6

a. Write short notes on- **03×02=06**

i) Flood wall and levee
ii) Gravity dam
iii) Diversion dam

b. Explain how urban flooding is different from rural flooding considering their impacts. **10**

c. Illustrate short term and long term measures for flood management. **08**

.d. Define floodplain. Briefly explain different flood zones which are classified based on flood occurrence probability in a year. **06**

Question 7

a. Briefly explain- **02×2.5=05**
   i) Hydraulic dredging
   ii) Watershed management

b. Define flood forecasting. Briefly explain the roles of flood forecasting in flood management. **08**

c. Briefly explain different approaches for evaluation of flood mitigation projects. **10**

d. Briefly explain advantages and disadvantages of flood proofing. **07**

Question 8

a. Explain briefly the methods of achieving navigability of a river. **06**

b. Discuss about different types of dredging. Explain with a figure why dredging for navigation is not sustainable. **08**

c. Discuss about the river systems of Bangladesh. Explain briefly the morphological evolution of Brahmaputra-Jamuna river. **08**

d. Due to a land slide incident, the sediment load, discharge and the depth of flow are increased by 30 %, 10 % and 5 % respectively at the downstream section. There was no significant change in the sediment size. Estimate the expected morphological changes at the downstream section and briefly explain your answer. **08**