University of Asia Pacific
Department of Civil Engineering
Final Examination, Spring 2012
Program: B. Sc. Engineering (Civil)

Course Title: Irrigation and Flood Control — Course Code: CE 461

Time: 3 hours — Full Marks: 150

Section A

Answer any five (5) questions of your choice out of the following seven (7) questions of Section A

1. (a) Describe Sprinkler irrigation method along with limitations of this system. (6)

   (b) What are the basic data requirements to start an irrigation project? And also discuss the outline of the project report. (7)

   (c) Determine the required flow to cover a strip of land of 0.02 hectares in area from a tube-well with a time of 45 minutes. The infiltration capacity of the soil may be taken as 3 cm/h and the average depth of flow on the field as 12 cm. (7)

2. (a) Define the following (any two): (6)
   (i) Field irrigation requirement
   (ii) Efficiency of water use
   (iii) Available water

   (b) Derive the following relationship: (6)

   The depth of water stored in the root zone $= \left(\frac{\gamma_d \times d \times F}{\gamma_w} \right)$ meters

   Where symbols carry their usual meanings.

   (c) A stream of 130 lps was diverted from a canal and 100 lps was delivered to a field. An area of 1.6 hectares was irrigated in 8 hours. (8)
   Effective depth of root zone = 1.7 m
   Runoff loss in the field = 420 m^3
   Depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.1 m at the tail end of the field
   Available moisture holding capacity of soil = 20 cm/m depth of soil
   Calculate (i) Conveyance efficiency, (ii) Application efficiency, (iii) Storage efficiency, (iv) Distribution efficiency, irrigation was started at a moisture extraction level of 50% of available moisture

3. (a) What is canal system? Draw the layout of an irrigation canal network. (6)

   (b) What is groyne? What are the differences between spur and groyne? (2+4)

   (c) An area of 300 hectares is to be irrigated from a minor channel with one outlet; C.C.A is 80% of total area. The intensity of irrigation is 50% for Rabi and 30% for Kharif crop. Taking loss in conveyance system as 5% of outlet discharge, determine the design discharge of the channel. Take outlet discharge factor for wheat season as 1500 ha/m^3/sec and for rice season 1000 ha/m^3/sec. (8)

4. (a) What is meant by "Piping" on foundation of a weir? Explain Bligh's method of safe guarding the foundation against the ill effects of piping. (6)

   (b) Using Khosla's curves, determine the following for the apron shown below: (14)
   [Assume: floor thickness = 1 m]

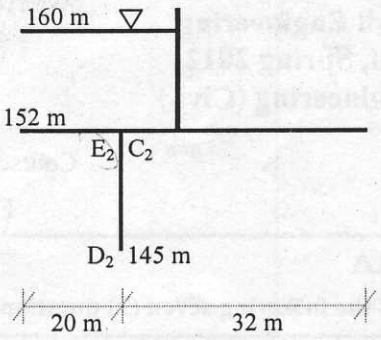


Fig. (i)

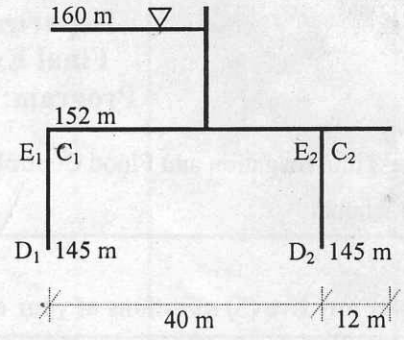


Fig. (ii)

(i) Find pressure at point C_2 only with thickness correction

(ii) Find pressure at E_2 with interference correction

Correction factor for slope, 3:1 = 4.5

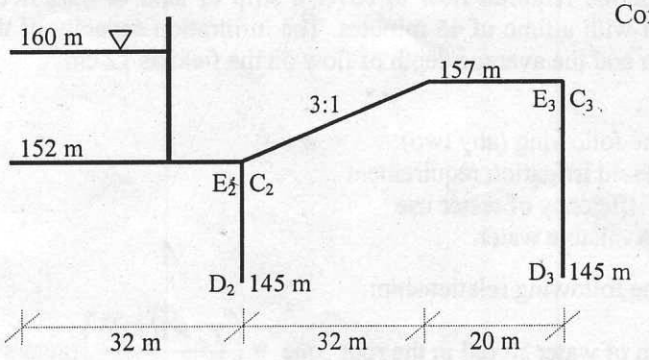


Fig. (iii)

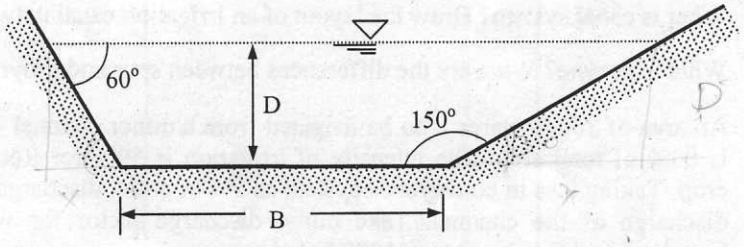
(iii) Find pressure at point C_2 with slope correction

5. (a) What are difference between barrage and weir? Draw the layout of diversion head works. (3+4)

(b) Explain canal head regulator along with its functions. (5)

(c) Find the necessary bed width (B) and water depth (D) for a channel using the following data: (8)

Full supply discharge = 10 cumec
C.V.R (m) = 1
Lacey's silt factor = 0.95
Bed slope = 1 in 5000



6. (a) What is Cross-drainage works? Differentiate between super-passage and siphon super-passage with neat sketch. (2+6)

(b) Distinguish Rapid fall and Stepped fall with neat sketch. (6)

(c) Draw the shape of Montague type of fall when its velocity and acceleration due to gravity 60 m/s and 20 m/s^2 respectively. (6)

7. (a) Distinguish between drop spillway and ogee spillway. (5)

(b) Describe a reciprocating pump with sketch along with its advantages and disadvantages. (5)

(c) Design the shape of an ogee spillway for the following data (5)

Maximum head over the crest = 5m
Height of the spillway = 15 m

Upstream face of the spillway is vertical for which constants value of k and n are 2.0 and 1.85 respectively.

(d) Determine the possible delivery head for a residential building if you purchase a centrifugal pump from the market with the following specifications: (5)

Brake Horse Power	= 35
Suction Head	= 5 m
Coefficient of friction	= 0.01
Pump efficiency	= 80 %
Pipe diameter	= 15 cm
Required delivery flow rate	= 150 l/s

Section B

Answer question no. 8 and any three (3) from the rest

8. Define Flood and Flood Management. Explain the different measures of Flood Management. (4+10)

9. Explain the following (any three) (3×4 =12)
   (i) Integrated Water Resources Management
   (ii) Process of Water logging
   (iii) Embankment
   (iv) Flood wall

10. Explain the process of salinization. How can you reclaim the salt affected soil? (4+8)

11. (a) Write down the names of the major studies and plans that shaped the water resources development of Bangladesh (6)

    (b) Write down the FAP guiding principles of Flood Management. (6)

12. What is Leaching Requirement? Deduce equation for Leaching Requirement. Estimate the required depth of irrigation water to be applied to the field if the Leaching Requirement is 5% and Consumptive Use Requirement of the crop is 75 mm. (3+5+4)

13. (a) What are the advantages and disadvantages of flood control projects? (8)

    (b) Define Integrated Flood Management. (4)

Necessary equations:

- $V = C\sqrt{RS}$
- $C = \left[\dfrac{\dfrac{1}{n}+\left(23+\dfrac{0.00155}{S}\right)}{1+\left(23+\dfrac{0.00155}{S}\right)\dfrac{n}{\sqrt{R}}}\right]$
- Regime slope equation,
  - $S = \dfrac{f^{3/2}}{4980\times R^{1/3}}$
  - $S = \dfrac{f^{5/2}}{3340\times Q^{1/6}} \Rightarrow Q = \left[\dfrac{f^{5/3}}{3340\times S}\right]^{6}$
- Regime scour depth, $R = 0.47\times\left(\dfrac{Q}{f}\right)^{1/3}$ or, $R = \dfrac{5}{2}.\dfrac{V^2}{f}$
- $V = \dfrac{1}{n}R^{2/3}\times S^{1/2}$
- $f = 1.76\sqrt{d_{mm}}$
- $Af^2 = 140\times V^5$
- $V = \left(\dfrac{Q\times f^2}{140}\right)^{1/6}$
- $P = 4.75\times\sqrt{Q}$
- Regime flow equation, $V = 10.8\times R^{2/3}\, S^{1/3}$