

Total No. of printed pages = 4

CE 181501

30/12/22

Roll No. of candidate

--	--	--	--	--	--	--	--	--	--

30/12/22

2022

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara,
Guwahati - 781017

B.Tech. 5th Semester End-Term Examination

CE

OPEN CHANNEL FLOW AND IRRIGATION ENGINEERING

(New Regulation & New Syllabus)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Q.No 1 and any four from the rest.

1. Choose the correct answer: (10 × 1 = 10)
- (i) A crop requires a total depth of 95 cm of water for a base period of 110 days. The duty of water will be
- (a) 746.2 hectares/ cumec (b) 979.5 hectares/ cumec
(c) 1000.4 hectares/cumec (d) None of the above
- (ii) Water Conveyance efficiency is expressed as ratio of
- (a) Consumptive use of water to water delivered
(b) Water stored in root zone to water delivered
(c) Water used beneficially to water delivered
(d) Water delivered to the farm to water supplied from the source
- (iii) The discharge per unit drawdown at a well is known as
- (a) Specific yield (b) Specific capacity
(c) Specific storage (d) Safe yield
- (iv) In canal diversion head work, the silt removing device used to remove the silt entered in the canal is
- (a) Silt Excluder (b) Silt Ejector
(c) Silt Pocket (d) Under sluices

[Turn over

(v) In a uniform flow there is a balance between

- (a) Gravity and inertial force (b) Gravity and frictional force
(c) Gravity and viscous force (d) Inertial and viscous force

(vi) In a GVF, H_3 - profile is

- (a) Lying between CDL and the bed and concave in nature
(b) Lying between NDL and the bed and concave in nature
(c) Lying between CDL and the bed and convex in nature
(d) Lying between NDL and the bed and convex in nature

(vii) The dimensions of the Manning's coefficient are _____.

- (a) $L^{-1/3}T$ (b) $L^{-1/2}T^{-1}$
(c) $M^0L^0T^0$ (d) $L^{1/3}T^{-1}$

(viii) If the critical depth in a triangular channel is 0.75m, the minimum specific energy is

- (a) 1.00 m (b) 1.125 m
(c) 0.625 m (d) 0.9375 m

(ix) For a triangular channel of side slopes z (Horizontal): 1(Vertical) depth of flow y and velocity of flow V ; the Froude number (F) is given by

- (a) $\frac{z}{\sqrt{gy}}$ (b) $\frac{v}{\sqrt{2gy}}$
(c) $\frac{v\sqrt{2}}{\sqrt{gy}}$ (d) $\frac{V}{\sqrt{gy}}$

(x) In case of Steady jump, Froude Number (F_1) and relative energy loss $\frac{E_L}{E_1}$ ranges from _____.

- (a) $2.5 < F_1 < 4.5$ and $21\% < \frac{E_L}{E_1} < 35\%$
(b) $2.5 < F_1 < 4.5$ and $18\% < \frac{E_L}{E_1} < 45\%$
(c) $4.5 < F_1 < 9.0$ and $35\% < \frac{E_L}{E_1} < 70\%$
(d) $4.5 < F_1 < 9.0$ and $45\% < \frac{E_L}{E_1} < 70\%$

BINA CHOWDHURY CENTRAL LIBRARY
(CMT & GIPS)
Azara, Hatkhowapara,
Guwahati - 781017

2. (a) (i) Distinguish between alternate depth and conjugate depth. Find the condition for maximum discharge at a given specific energy. (1+3+3=7)
- (ii) The specific energy for a 5m wide rectangular channel is 4 N-m/N. Find the maximum possible discharge.
- (b) Explain the variation of flow due to reduction in channel width for both sub-critical and super critical approach with the help of unit discharge depth diagram for a rectangular channel. (8)
3. (a) (i) Find the condition for hydraulically efficient triangular channel section.
- (ii) A rectangular channel 10 metre wide carries a discharge of 85 cumec at a slope of 0.006. Compute normal depth and also find the maximum shear on the bed. Take, Manning's $n = 0.015$. (4+6=10)
- (b) Show that for wide rectangular channel the slope is mild or steep according to s_b being less or greater than $\left[\frac{n^2 g^{10/3}}{q^{2/9}} \right]$ where, q =discharge per unit width, n =Manning's constant. (5)
4. (a) Stating all the assumptions made derive the dynamic equation of GVF under steady state condition. (5)
- (b) (i) Show that for a hydraulic jump in a rectangular horizontal channel $\frac{16g^{1/3}E_L}{q^{2/3}} = \frac{(-3 + \sqrt{1+8F_1^2})^3}{F_1^{2/3}(-1 + \sqrt{1+8F_1^2})}$ where, E_L =loss of energy, q = discharge per unit width and F_1 =Froude's number at depth y_1 , g = acceleration due to gravity.
- (ii) A sluice gate discharging into a horizontal rectangular channel carries a discharge with a super critical velocity of 8 m/s at a depth of 0.5m. Find the height of jump loss of energy and relative loss of energy. (5+5=10)
5. (a) (i) Name different methods of controlled flooding method of irrigation. Explain any one of them with merits and demerits. (5+5=10)
- (ii) Briefly discuss various water holding capacities of soil with a sketch.
- (b) A water course is designed to irrigate an area of 840 hectare of rice, The transplantation of rice takes 15 days and during this period the total depth of water required is 40cm. Find the duty of irrigation water on the field if there is an effective rainfall of 10cm. Also find the duty and discharge at the head of the water course, assuming losses of water as 25% in the water course. (5)

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara,
Guwahati - 781017

6. (a) (i) Draw the plan of a typical layout of a canal-diversion head works showing all its major components. (3+5=8)
- (ii) Write a brief note on ridge canal with a sketch in plan and section.
- (b) Design an irrigation canal using Lacey's silt theory to carry a discharge of 40cumec through a bed material of having silt factor 1.0 and considering side slope = 0.5 H; 1V. (Take bottom width of the channel is 37.5 times of the depth of flow). (7)
7. (a) (i) Define the terms Cash Crops, Kor Depth, Consimptive use, Quantity duty (4+7=11)
- (ii) Describe atleast three types of cross drainage works with plan and sectional elevations.
- (b) A 30 cm diameter well completely penetrates a confined aquifer of permeability 5.2×10^{-4} m/s. The length of the strainer is 20 m. Under steady state pumping, the drawdown at the well was found to be 3.0 m and the radius of influence was 300m. calculate the discharge. (4)

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Halkhowapara,
Guwahati-781017