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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Civil Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX4533 Irrigation Engineering**
Academic Year	: 2018/19
Date	: 23rd January 2019
Time	: 1330-1630hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Five (5)** questions in **Three (3)** pages.
3. Answer all **Five (5)** questions. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Relevant charts/ codes are provided.
6. This is a Closed Book Test(CBT).
7. Answers should be in clear hand written.
8. Do not use Red colour pen.

(Q1) Making suitable assumptions estimate the irrigation duty (ID) for the first 30 days of lowland paddy of 105 days according to the data provided below. Student must make appropriate assumptions for the calculations

Data:

Month : October

Effective rainfall : 76 mm

ET_o for October : 157 mm

Crop factor for Lowland paddy 105 For initial 30 days. : 1.00

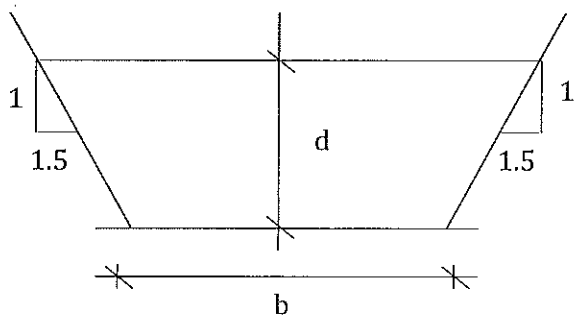
Water requirement for land preparation : 178 mm / month

Period of land preparation : 15 days

Form losses : 152 mm / month

For Unlined canal; ID = 1.43 FIR

(Q2) Design an unlined irrigation canal to carry water for a paddy land of 115 acres assuming 1 cusec can irrigate 40 acres. The proposed trapezoidal section is shown in the diagram.



Data

Manning's constant C : 0.025

b = 4d

Canal slope (n) : 0.00035

Hint : 0.2 m~d~0.3m

Manning's formula

$$V = \frac{1}{n} \times R^{2/3} S^{1/2}$$

1 m^3/s = 35.3 cusec

(Q3) Estimate the capacity of the reservoir required to supply irrigation demand for following tabulated data.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Inflow (MCM)	64.9	80.6	12.8	6.5	4.3	12.1	5.1	4.5	1.5	0.9	0.3	0.1
Monthly Irrigation Demand (MCM)	6.5	8.8	12.4	15.5	11.8	10.8	15.8	21.8	24.1	22.4	15	5.7

Draw the respective cumulative curves and justify your answer.

(Q4)

(a) Determine the F.S.L for a reservoir for a critical period of 20 to 24 hours. Area capacity details are as follows

Elevation (m)	61.6	62.5	63.3	64
Capacity MCM	259	286.1	313.3	340.4

Time (hrs)	Time internal hours	Inflow Rate m^3/S	Mean Rate m^3/S	Inflow Volumes In MCM
20	-	697	-	-
24	4	1244	970.5	13.975

Data

Spill type : Radial gate type
No. of gates : 6
Height of gate : 3.8 m
Width of gate : 6 m
Spill Discharge : $Q = CLH^{3/2}$

Where; C : 2.07
L : length
H : head over the concrete spill

(Q5)

(a) From the first principles, derive the following equation, which assess the risk(R) of flood with a return period of T number of years within a period of n number of consecutive years.

$$R = 1 - \left(1 - \frac{1}{T}\right)^n$$

(b) In a ranking table of storms with 45 years of storm records, two different rainfalls of 160 and 140 mm/h are ranked 16 and 7 respectively. Determine the risk of flood due to a rainfall of intensity 150 mm/h.

You may use the following equation for calculations.
Weibull's formula

$$m = \frac{n+1}{T}$$

Where;
T= average return period in years
n = number of years in record
m = rank of storm with most intense storm given a rank of 1