5 H TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Hill Irrigation Engineering *(Elective II) (CE76508)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Flow measurement made on 26th February on a river stream was 172 lps, drained from a catchment of 14 sq. km. Estimate the mean monthly flow and 80% reliable flow from this watershed, if predicted 80% April flow is 35% of April mean monthly flow. MIP non-dimensional regional hydrographs for mean monthly and 80% reliable flow of the region are given below: [10]

Flow,m^3/s\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean monthly	2.42	1.82	1.36	1.00	0.91	2.73	11.21	13.94	10.00	6.52	4.55	3.33
80% reliable	2.38	1.77	1.35	1.00	1.08	2.23	6.15	13.85	10.77	6.54	4.42	3.27

2. Determine half monthly values from monthly evapo-transpiration (mm/day) for 12 months. [6]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.212	2.213	3.391	4.665	5.302	5.478	5.387	4.925	4.200	2.940	1.819	1.191

3. Design a settling basin for a HIS having medium intake site. Design discharge = 550 lps; size of silt to be trapped = 0.5 mm. Take $Q/A_s = 0.019$ and critical bottom velocity = 0.24 m/s. Assume scour velocity for flushing = 1.8 m/s. [8]

4. Define the rate of a sprinkler application for a crop having root depth 1.25 m and ET_{crop} equal to 4.75 mm/day. The sprinklers are decided to be operated 16 hours. Assume that the extractable water from the given soil condition is 0.25 fraction. [8]

5. Design a cascade drop to lower the water level in the canal by 2.5 m. The canal is carrying a discharge of 350 lps, having bed width 65 cm. The existing ground slope at the drop is 1.5:1 (H:V). [8]

6. Design a steel rack for a bottom rack intake of HIS. Flow rate upstream of the rack = 480 lps; flow rate downstream of the rack = 220 lps; rack opening = 16 mm; bar diameter = 33 mm; plugging coefficient = 0.03. Take $C_d = 0.5$. [6]

7. "Sprinkler and Drip irrigation are appropriate and sustainable methods in the hills of Nepal". Justify this. [6]

8. Point out the basic problems of canal irrigation in the hills of Nepal. Also suggest respective solutions for these problems. [8]

9. Write short notes on any five of the following: [5*4]
   a) Farming Systems of Nepal
   b) Sediment control structures for hilly canals
   c) Suitable cross drainage structures in HIS
   d) Need of escapes and their types used in HIS
   e) Seepage problems in hilly canals and their solutions
   f) Advantages of gabion construction in hills
   g) Vegetative measures in cutting area

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5 H TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Hill Irrigation Engineering *(Elective II) (CE76508)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Design a RCC chute for a HIS. The earthen canal has a discharge of 500 lps having bed width 0.8m and water depth 0.6m with side slope 1:1. The ground slope at the drop is about 1:1.25 (V:H) and the canal is to be dropped by 3.25 m. [8]

   b) Compute irrigation interval and numbers of hours of irrigation per day for a 16 mm drip line 2.2 lit/hr dripper, if lateral spacing of drip line is 1.1 m and dripper spacing is 0.75 m. Available water for the given soil is 18%. The crop having 90 cm rooting depth consumes water 6 mm daily. [8]

2. a) Design a settling basin for a Hill Irrigation System having poor intake site. Design discharge = 550 lps; size of silt to be trapped = 0.5 mm. Take Q/As = 0.018 and critical bottom velocity = 0.28 m/s. Assume scour velocity for flushing = 1.9 m/s. [8]

   b) Design a steel rack for a bottom rack intake of HIS. Flow rate upstream of the rack = 500 lps; flow rate downstream of the rack = 250 lps; rack opening = 15 mm; bar diameter = 30 mm; plugging coefficient = 0.02. Take $C_d = 0.5$. [8]

3. a) Flow measurement made on 21st May on a river stream was 420 lps, drained from a catchment of 40 sq.km. Estimate the mean monthly flow and 80% reliable flow from this catchment, if predicted 80% April flow is 40% of April mean monthly flow. MIP non-dimensional regional hydrographs for mean monthly and 80% reliable flow of the region are given below: [8]

Flow,m^3/s\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean monthly	2.42	1.82	1.36	1.00	0.91	2.73	11.21	13.94	10.00	6.52	4.55	3.33
80% reliable	2.38	1.77	1.35	1.00	1.08	2.23	6.15	13.85	10.77	6.54	4.42	3.27

   b) Determine half monthly values from 80% reliable monthly rainfall data (mm) for 12 months. [8]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11	17	20	32	64	156	324	260	240	150	25	12

4. a) What is a prerequisite for government assistance to farmer's irrigation projects? What type of detail it should contain? How the project is selected for government assistance? [2+4+2]

   b) Describe types of cross drainage structures used in HIS with neat sketches. [8]

5. a) "Micro irrigation methods are sustainable in the hills of Nepal". Justify this statement. [8]

   b) How drop structures can be used to control erosion and water level of canal in HIS? Illustrate your answer with neat sketches. [8]

6. a) Write down the stepwise procedures for the calculation of Gross Irrigation Water Requirement. [8]

   b) What are the advantages of gabion construction in HIS. Enumerate characteristics of fill materials and gabion wire for such constructions. [6+2]