Sixth Semester B.E. Degree Examination, July/August 2021
Hydraulic Structures and Irrigation Design Drawing

Time: 4 hrs. Max. Marks:100

Note: 1. Answer any TWO questions from PART-A and any ONE question from PART-B.
2. Any missing data may be suitably assumed.

PART – A

1. a. Explain the zones of storage in a reservoir with the help of a neat sketch. **(07 Marks)**
   b. The monthly yield of water from a catchment is given below. Determine the minimum capacity of the reservoir by mass curve method if the flow is drawn at a uniform rate. Values are given in million cubic meters.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Inflow volume million m^3	1.5	2.0	3.0	9.0	12.0	12.0	8.0	3.0	2.5	2.2	2.0	1.7

   (08 Marks)

2. a. Explain how and why an elementary profile of a gravity dam is modified to give a practical profile. **(08 Marks)**
   b. Following data were obtained from the stability analysis of a concrete gravity dam:
      (i)   Total over turning moment about Toe = 1.2×10^6 kN-m
      (ii) Total resisting moment about toe = 2.2×10^6 kN-m
      (iii) Total vertical forces about the base = 50000 kN
      (iv) Base width of the dam = 50 m
      (v)   Slope of the D/S face = 0.8H : 1.0V
      Calculate the maximum and minimum vertical stress to which the foundation will be subjected to? What is the maximum principal stress at toe? Assume there is no tail water.
      (07 Marks)

3. a. Explain the causes for failure of earthen dam. **(10 Marks)**
   b. For a homogeneous earth dam 52 m high and 2m free board, a flow net was constructed and the following results were obtained:
      Number of potential drops = 25
      Number of flow channels = 4
      The dam has a horizontal filter of 40 m length at its downstream end. Calculate the discharge per meter length of the dam if the coefficient of permeability of the dam is 3×10^{-3} cm/sec. **(05 Marks)**

4. a. Explain the design criteria for earthen dams. **(07 Marks)**
   b. Explain various forces that act on gravity dam. **(08 Marks)**

5. a. The monthly discharge volumes in million m^3 for period of 24 months recorded at stream gauging site are: 3, 6, 16, 30, 18, 15, 10, 8, 6, 4, 3, 1, 2, 5, 17, 28, 20, 15, 12, 7, 5, 4, 3 and 2. Determine size of reservoir proposed at the gauging sire if it is to maintain an assured supply of 8.33 million m^3 per month. The water year may be taken as June-May. **(08 Marks)**
   b. Briefly explain elementary profile of a gravity dam. **(07 Marks)**

PART – B

6   Design the surplus work of a tank forming part of a chain of tanks:

Combined catchment area = 25.9 sqkm

Intercepted catchment area = 20.7 sqkm

Maximum water level = +12.75

Full tank level = +12.00

Ground level at proposed site = +11.00

Ground level below proposed weir upto a reach of 6m slopes down to an RL = +10.00

Top width of tank bund = 2m

Tank Bund Level (TBL) = +14.50

Side slope of bund on either side = 2:1

Design saturation gradient = 5:1

Level of Hard strata = +9.50

Ryve's coefficient for combined catchment = 9

Ryve's coefficient for intercepted catchment = 1.5

Make provision to store water up to MWL. Proper abutment, wing walls, returns and stepped types apperture to be designed.   **(25 Marks)**

Draw to a suitable scale:

a. Half plan at top and half at foundation.   **(20 Marks)**

b. Half elevation and half sectional elevation.   **(15 Marks)**

c. Cross section across the weir.   **(10 Marks)**

7   Design a canal drop with trapezoidal notches with the following hydraulic particulars:

Canal data	U/S of the drop	D/S of the drop
Full supply discharge	6 cumecs	6 cumecs
Bed level	100.00	98.00
Bed width	6 m	6 m
Full supply depth	1.5 m	1.5 m
Full Supply Level (FSL)	101.50	99.50
Top width of canal bank	2.0 m	2.0 m
Top level of bank	102.50	100.50
Side slope of canal bank:		
(i) Water side	1:1	1:1
(ii) Rear side	1.5:1	1.5:1

Ground level at the site +100.00

Good soil is available for foundation at +98.00   **(25 Marks)**

Draw to a suitable scale:

a. Half plan at top and half at foundation level.   **(20 Marks)**

b. Half elevation and half longitudinal section.   **(15 Marks)**

c. Cross section across the drop wall.   **(10 Marks)**

8   Design (Hydraulic design only) a suitable cross-drainage work given the following data at the crossing of a canal and a drainage.

Canal :

Full supply discharge   = 32 cumes

Full supply level   = + 213.5

Canal bed level   = + 212.0

Canal bed width   = 20

Trapezoidal canal section with 1.5H : 1V slopes

Canal water depth   = 1.5m

Drainage :

High flood discharge	= 300 cumes
High flood level	= 210.0m
High flood depth	= 2.5m
General ground level	= 212.5m.

(25 Marks)

Draw :

a. Plan showing all details.   (20 Marks)

b. Longitudinal section.   (15 Marks)

c. Cross section showing all details.   (10 Marks)

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