Enrollment ID: _____

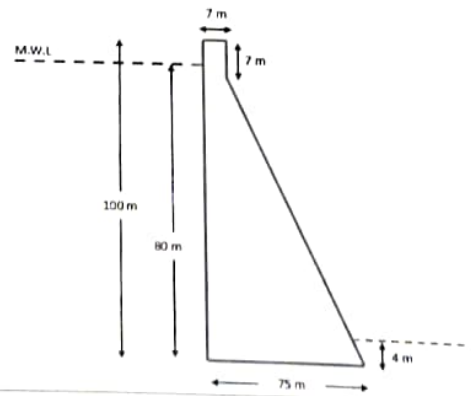
Navrachana University
School of Engineering & Technology
End-Semester Examination May 2023
B. Tech Civil Engineering
3rd Year and 6th Semester
Hydraulic Structures and CE-320

Date: 16-05-2023
Time: 2 pm to 4 pm **Marks: 40**

Instructions:

- ➔ Write each answer on a new page
- ➔ Use of a calculator is permitted
- ➔ Explain using sketches wherever necessary
- ➔ Formulations and Graphs required as a reference to solve numericals are attached with the paper.

Q1. Short questions (Any ten)	**(10 Marks)**	**CO**	**BTL**
1. _____type of crossdrainage works are preferred when bed level of canal is above the highest flood level of drainage. 2. Earthern dams are built in areas where the foundation is not strong enough to bear the weight of a concrete dam. (True /False) 3. _____structure acts like safety valve to the dam structure. (a) Aqueduct (b) Spillways (c) Under sluices (d) All of them 4. Pipping occurs when exit gradient > critical value for the soil. (True /False) 5. Equipotential lines and Flow lines cross each other at right angles. (True /False) 6. Reservior sedimentation component (True /False). 7. _____types of canals are constructed for hydropower generation. (a) Feeder Canal (b) Branch Canal (c) Hydel Canal (d) None of them 8. Trap efficiency (η) of resrvior has been found to be a function of capacity-inflow ratio. (True /False) 9. The crest of the under-under sluice portion of the weir is kept at a 1 to 1.5 m lower than the crest of the normal portion of the weir. (True/False) 10. Define Uplift pressure 11. _____type of soil is preffered for inner zone of the earthern dam.		1,2,3,4	1,2,3,4

Q2. Attempt the following. (a) Explain in detail any two components of diversion head works. (b) Describe types of seepage failures of earthern dam and explain any one in detail. **OR** (c) Explain the various storage zones of a reservoir in detail. (d) List various types of crossdrainage works and explain any two in detail with a diagram. **OR** (e) Describe the various types of energy dissipators in spillways. (f) State various components of irrigation canal and explain any three in detail with a diagram.	**(20 Marks)**	**1,2,3,4**	**1,2,3**
Q3. Design a D/S profile for the ogee-type spillway of a concrete gravity dam having the downstream face sloping at a slope of 0.7 H: 1 V. The design discharge for the spillway is 8,000 cumecs. The height of the spillway crest is kept at RL 354.0 m. The average river bed level at the site is 147 m. The spillway length consists of 6 spans having a clear width of 10 m each. The thickness of each pier may be taken to be 3 m. **OR** **Q3.** The section of a gravity dam built of concrete is shown in the figure below. Examine the overturning stability of this section at the base under reservoir full condition. A tailwater depth of 4 m is assumed to be present when the reservoir is full Assume the unit wt. of concrete as 24 kN/m^3; and the unit wt. of water = 10 kN/m^3.  	**10 Marks** **10 Marks**	**2,3**	**2,3,4,6**

Formulations and Graphs

$$x^{1.85} = 2 \cdot H_d^{0.85} \cdot y$$

$$FOS = \frac{\sum M_R}{\sum M_O}$$

$$Q = C \cdot L_e H_e^{3/2}$$

$$p_{\frac{max}{min}} = \frac{\Sigma V}{B}\left[1 \pm \frac{6e}{B}\right]$$

$$x = -0.27\, H_d$$

$$L_e = L - 2\left[K_p \cdot N + K_a\right] H_e$$

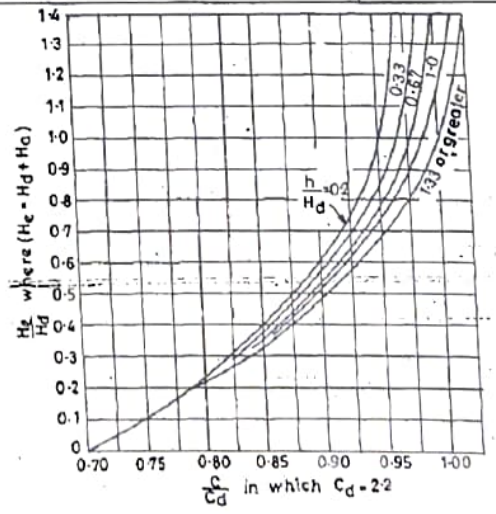
$$S.F.F. = \frac{\mu \Sigma V + B \cdot q}{\Sigma H}$$

Kp Values (Spillway)

S. No.	Pier Shape	Contraction coefficient K_p
1.	Square nosed piers without any rounding	0.1
2.	Square nosed piers with corners rounded on radius equal to 0.1 of pier thickness	0.02
3.	Rounded nose piers and 90° cut water nosed piers	0.01
4.	Pointed nose piers	0.0

Ka Values (Spillway)

S. No.	Shape of abutment	Contraction coefficient K_a
1.	Square abutment with head wall at 90° to the direction of flow	0.2
2.	Rounded abutment with head wall at 90° to the direction of flow	0.1



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