

**HYDRAULICS STRUCTURES
(CIVL 4144)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The process of laying and compacting earth in layers by power rollers under OMC for construction of earthen dams is known as
(a) Rolled fill method (b) Hydraulic fill method
(c) OMC method (d) Compaction.
- (ii) _____ is a temporary dam constructed to exclude water from a specific area.
(a) Debris dam (b) Diversion dam
(c) Cofferdam (d) Storage dam.
- (iii) Silt storage in the reservoir is same as
(a) dead storage (b) live storage
(c) effective storage (d) total storage.
- (iv) In a diversion headwork project, the canal head regulator is usually aligned
(a) parallel to barrage axis (b) perpendicular to the divide wall
(c) parallel to the divide wall (d) 45° to the divide wall.
- (v) The dams that are often called as spillways
(a) overflow dams (b) diversion dams
(c) non-overflow dams (d) rigid dams.
- (vi) For the stability of a structure against seepage pressure according to Khosla's creep theory, the critical gradient is
(a) Zero (b) 0.25 (c) 0.50 (d) 1.0.
- (vii) The blanket in earth dam is provided
(a) at the ground level on u/s side
(b) at the ground level on the d/s side
(c) at the ground level of the D/s side of the dam
(d) on the D/s slope.

- (viii) The factor that does not try to destabilise a masonry gravity dam is
(a) Water seeping below the foundation of the dam
(b) Generation of waves by high winds
(c) Deposition of silt in dead storage zone of reservoir
(d) Water standing against the downstream face of the dam
- (ix) The undersluices in a diversion headwork are provided with a crest level
(a) same as the rest of the weir (b) lower than the rest of the weir
(c) higher than the rest of the weir (d) same as the crest of canal regulator
- (x) The maximum permissible eccentricity for no tension at the base of a gravity dam is
(a) $B/2$ (b) $B/3$ (c) $B/4$ (d) $B/6$.

Group - B

2. (a) Draw and explain with diagram various types of diversion weirs.
(b) Mention at least three effects for construction of weir or barrages on a river regime. **7 + 5 = 12**
3. (a) Differentiate between a weir & a barrage with the help of neat sketches.
(b) What are the various criteria to be followed for investigation, planning, and layout before construction of weir or barrage? Explain briefly. **4 + 8 = 12**

Group - C

4. The accompanying Fig.1 shows the section of a hydraulic structure on permeable foundation. Calculate the average hydraulic gradient according to Bligh's creep theory and Lane's weighted creep theory. Also find the uplift pressures at point A, B and C as shown in fig. And also the floor thickness required at these points. Locate the points where both the required floor thickness is same, from both the theories.

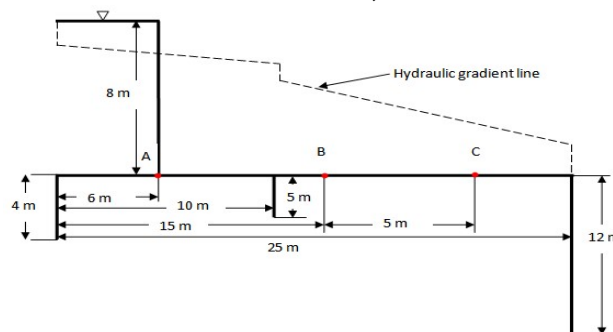


Fig.1

5. (a) Write short note on Failure by piping.
(b) Explain briefly Khosla's exit gradient concept, Bligh's creep theory, Lane's weighted creep theory. **3 + 9 = 12**

Group - D

6. What is the difference between dam and reservoir? How dam can be classified according to the material used for dam construction, according to use and according to hydraulic design. Describe about the usefulness and ill-effects of dam construction. (2 + 4 + 6) = 12

7. (a) Write short note on homogenous and zoned type dams.
 (b) An earthen dam made of homogenous material has the following data.
 Level of top of dam = 220m
 Level of deepest riverbed = 165m
 HFL of reservoir = 195m
 Width of top of dam = 6m
 Upstream slope = 3:1
 Downstream slope = 1.5:1
 Determine the phreatic line for this dam section and also the discharge through the dam. 5 + 7 = 12

Group - E

8. (a) Write short note on Water Pressure on a gravity dam.
 (b) Draw typical cross-section of a concrete gravity dam. Discuss the modes of failures for gravity dam. 3 + (2 + 7) = 12

9. The cross-section of a gravity dam is shown in Fig.2 Determine the maximum vertical stresses at heel and toe; the major principal stress at toe; the intensity of shear stress on a horizontal plane near the toe. Assume weight of concrete = 24 kN/m³.

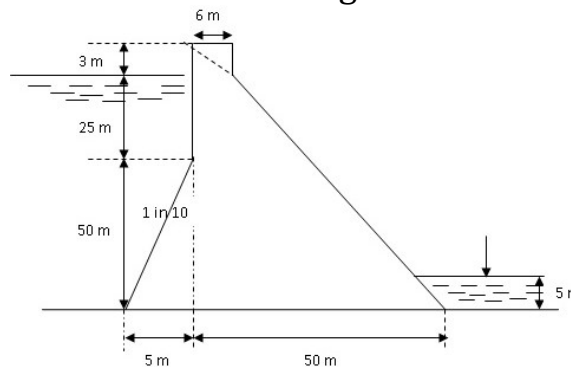


Fig.2

12

Department & Section	Submission link:
CE A	https://classroom.google.com/u/1/c/MTQ4MzQwMTM0NDA2/a/MjY0NzU1ODc4NDQ0/details
CE B	https://classroom.google.com/u/1/c/MTI3MzE5OTY3NzE1/a/MjY0NzU1ODQyNDg3/details