

HYDRAULIC STRUCTURES (CIVL 4241)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) The two main causes of failure of hydraulic structures on the pervious foundation are
 (a) Overturning and uplift (b) Undermining and uplift
 (c) Overturning and piping (d) Seepage and seegregation
- (ii) 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
- (iii) Value of Khosla's critical exit gradient for usually met alluvial sandy soils of our country is about
 (a) 0 (b) 1
 (c) ∞ (d) 1/4 to 1/6
- (iv) The hydraulic structures constructed across a river and supplies water to the off-taking canal is called
 (a) Weir (b) canal headwork
 (c) diversion headwork (d) Undersluices
- (v) The hydraulic jump occurs during which of the following types of flow?
 (a) Shooting (b) Laminar
 (c) Streaming (d) Critical
- (vi) The central core of the zoned embankment type earth dam
 (a) checks the seepage (b) prevents piping
 (c) gives stability to the central impervious fill (d) distribute the load over a large area
- (vii) Which type of dam is suitable on shallow pervious foundations?
 (a) Zoned embankment type (b) Diaphragm type
 (c) Homogenous type (d) Both Homogenous and Non- Homogenous type
- (viii) Which of the following spillway is least suitable for an earthen dam
 (a) Ogee spillway (b) Chute spillway
 (c) Shaft spillway (d) Side channel spillway
- (ix) Silt excluders are constructed....., while silt ejectors are constructed.....
 (a) on the river bed, on the diversion headworks (b) on the river bed, on the bed of off taken canal
 (c) on the bed of off taken canal, on the river bed (d) on the diversion headworks, on the river bed
- (x) The discharge through a Cipolletti weir is given by
 (a) $\frac{2}{3} C_d \sqrt{2g} L H^{3/2}$ (b) $\frac{8}{15} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{3/2}$
 (c) $\frac{8}{15} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{5/2}$ (d) $\frac{2}{3} C_d \sqrt{2g} L H^{5/2}$

Fill in the blanks with the correct word

- (xi) The blanket in earth dam is provided at _____.
- (xii) _____ is the arrangement made near top of dam for passage of excess water from the reservoir.
- (xiii) The maximum permissible eccentricity for no tension at the base of a gravity dam is _____.
- (xiv) Gravity dam is most suitable when the foundation is _____.
- (xv) Tension cracks in the dam may sometimes lead to the failure of the structure by _____.

Group - B

2. (a) Discuss the various causes of failure of diversion headworks and how they can be prevented.
- (b) Short note on River Training works with figure.

[[CO4](Remember/LOCQ)]

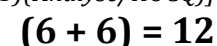
[[CO4](Remember/LOCQ)]

7 + 5 = 12

- $$9 + 3 = 12$$

Group - C

- $$8 + 4 = 12$$



- $$(6 + 6) = 12$$

Group - D

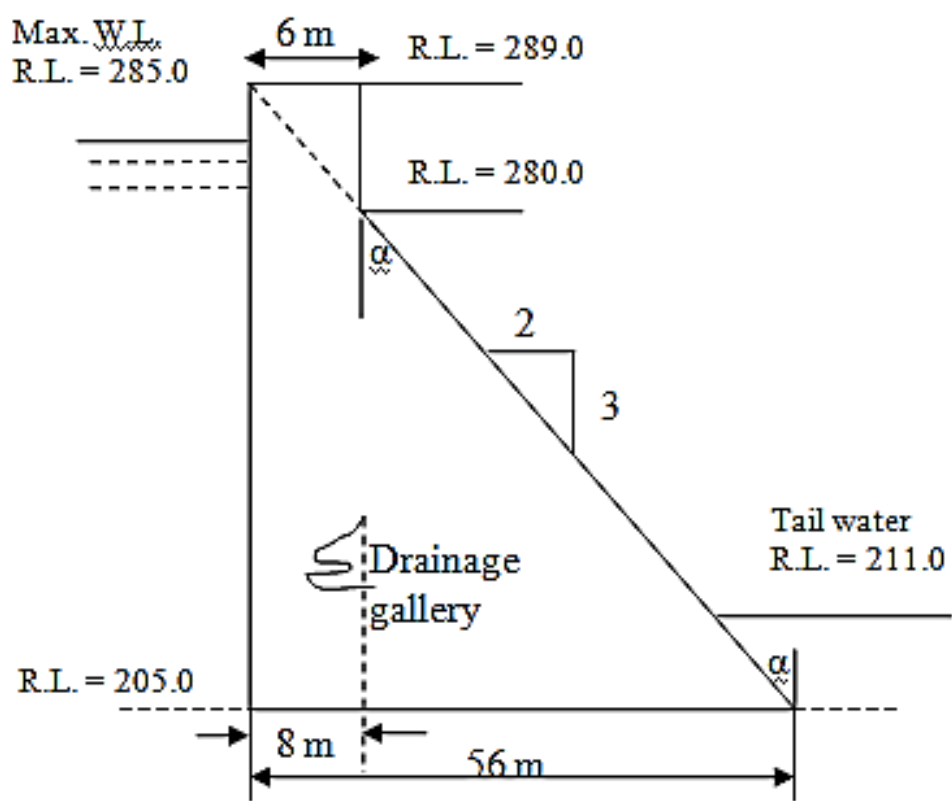
- $$6 + 6 = 12$$

- (b) An earthen dam made of homogenous material has the following data.

$$5 + 7 = 12$$

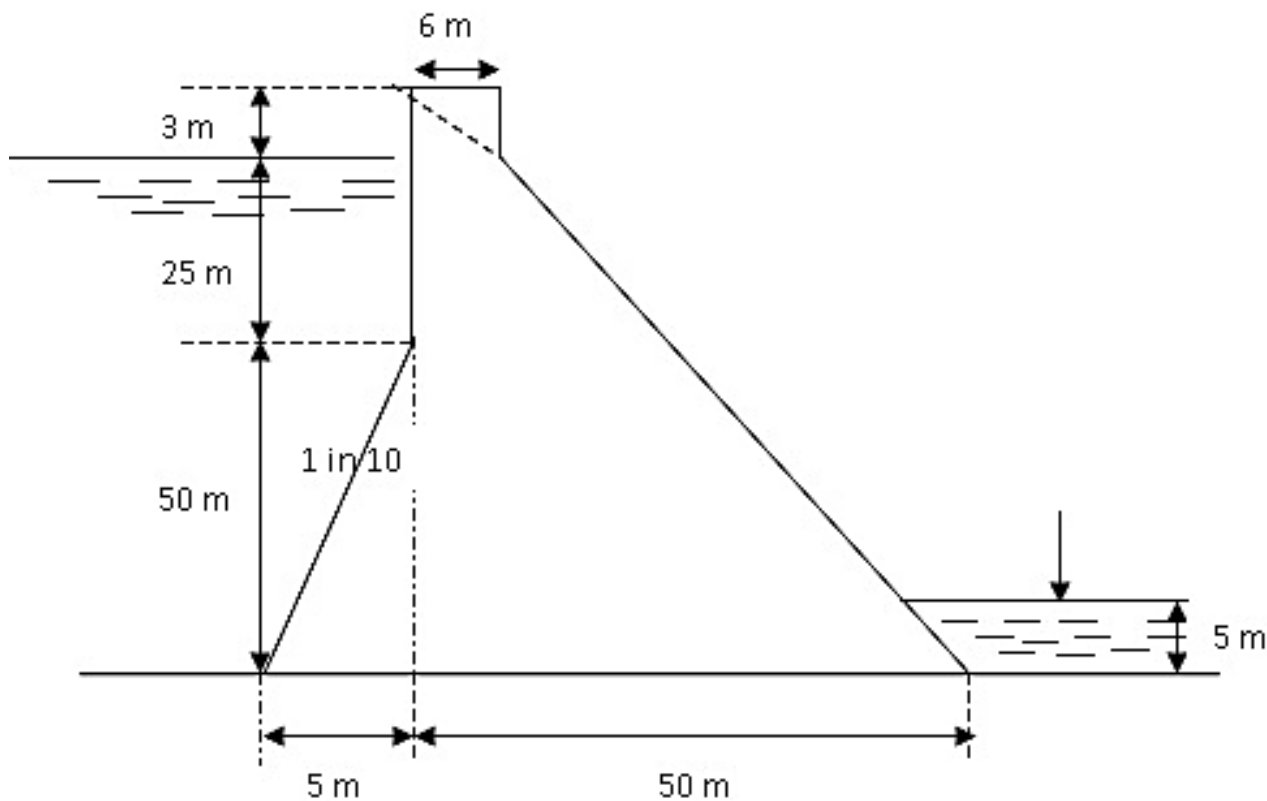
Group - E

8. The cross-section of a gravity dam is shown in figure. 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.



[[CO6)(Analyse/HOCQ)]
12

9. The cross-section of a gravity dam is shown in figure. 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.



[[CO6) (Apply/IOCQ)]
12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	46.9	12.5	40.6

