



Seat No. : _____

5337**December-2008****Irrigation**

Time : 3 Hours]
(10 : 30 A.M. to 1 : 30 P.M.)

[Max. Marks : 100

- Instructions :**
- (1) Answer to each section must be written in separate answer books.
 - (2) Assume your own suitable data if required.
 - (3) Figure to the right indicate full marks.
 - (4) Calculation aid is permitted.

Section – I

1. (a) What is "Assessment of irrigation water" ? Why it is required ? In which situation volumetric method is adopted ? What are its shortcomings ? 18
- (b) Define the following terms :
 Field capacity, water conveyance efficiency, Hygroscopic water, permanent wilting point, water application efficiency and outlet factor.
- (c) After how many days will you supply water to soil in order to ensure efficient irrigation of the given crop, if
- (i) Field capacity of soil = 30%
 - (ii) Permanent wilting point = 15%
 - (iii) Density of soil = 1.5 g/cm³
 - (iv) Effective depth of root zone = 80 cm
 - (v) Daily consumptive use of water for the given crop = 10 mm.

OR

- (a) Under what conditions sprinkler method of irrigation is preferred ? Write down the advantages and disadvantages of this method.
- (b) Discuss in brief the benefits and ill effects of irrigation.
- (c) The base period, Duty of water and area under irrigation for various crops under a canal system are given in table. The total culturable command area is 40,000 Ha. If the losses in the reservoir and canals are respectively 15% and 25% determine the reservoir capacity.

Crops	Wheat	Sugarcane	Cotton	Rice
Base period in (days)	120	320	180	120
Duty (ha/cumecs)	1900	1500	1400	900
% Area irrigated	45%	25%	10%	20%

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2. (a) What do you understand by the elementary profile of the gravity dam ? Derive the expression for determining the base width of such a dam based on (i) Stress criteria and (ii) Sliding criteria. 16
- (b) Explain various methods of reducing seepage through earthen dams.
- (c) Fig.-1 shows the section of gravity dam (Non Overflow portion) built of concrete. Calculate (Neglecting earthquake effects)
- (i) The maximum vertical stresses at the heel and toe of the dam.
 - (ii) The major principal stresses at toe of the dam.
 - (iii) The intensity of shear stress on a horizontal plane near the toe
- Assume weight of concrete = 24 kN/m^3

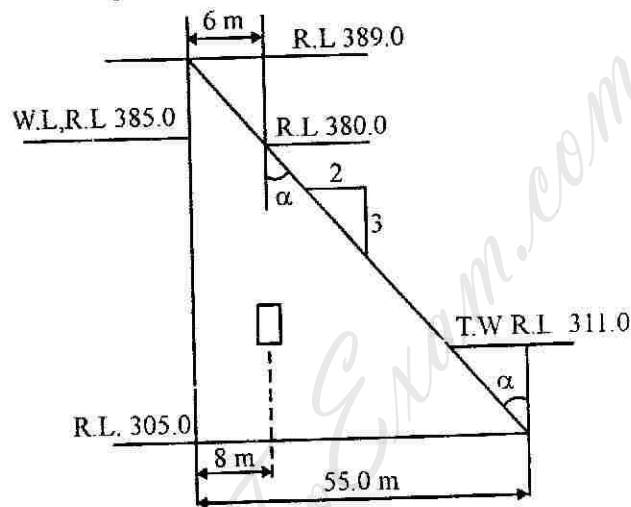


Fig.1

OR

- (a) How would you proceed to determine phreatic line through homogeneous earth dams provided with a horizontal filter ?
- (b) What do you mean by Gravity dam ? Enlist with sketch the various forces and discuss uplift pressure force in detail.
- (c) Following data refers to homogenous earth dam :
 - Top width = 4 m
 - Head of water $u/s = 16 \text{ m}$
 - u/s and d/s slope = $2.5 \text{ H} : 1 \text{ V}$ and $2 \text{ H} : 1 \text{ V}$ respectively
 - Free board = 2.5 m
 - Horizontal filter 37 m from d/s toe.
 - Coefficient of permeability $K = 0.008 \text{ cm/sec}$.
 - Calculate seepage per meter length of dam.

3. Write short notes on (any four) : 16
- (i) Galleries in Gravity dam
 - (ii) Crop Rotation
 - (iii) Rock fill dam
 - (iv) Bucket type energy dissipation device
 - (v) Ogee spillway

Section – II

4. (a) Draw a neat sketch of diversion headworks and explain functions of each component. 18
- (b) What are the methods of controlling entry of silt at the headworks of a canal ?
- (c) Explain the Bligh's Creep theory for the design of impervious floor on permeable foundations. What are the limitations of this theory ?

OR

- (a) What do you understand by exit gradient ? How would you compute it ? What is its significance ?
- (b) Discuss briefly the causes of failure of hydraulic structures founded on pervious foundation.
- (c) Design an irrigation canal to carry a discharge of 5 cumecs. Take critical velocity ratio = 1, bed slope of canal 0.2 m per km and Chezy's constant $C = 42.85$. Use Kennedy's approach
5. (a) Differentiate between : 16
- (i) Weir and Barrage
 - (ii) Silt excluder and Silt ejector
- (b) Explain Khosla's method of independent variable for weir design. How corrections are applied for (i) thickness of floor (ii) inclination of floor (iii) interface of pile.
- (c) What is initial and final regime conditions of an alluvial channel according to Lacey ?

OR

- (a) Explain various types of canal according to various classification systems.
- (b) Describe with the help of sketches, the various types of cross-drainage works.
- (c) Design an irrigation canal using Lacey's theory for the following data :
- Discharge = 45 cumecs
- Silt factor $f = 1$
- Side slope = $\frac{1}{2} : 1$

6. Write short notes on (any **four**) :

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- (i) Bandhara irrigation
 - (ii) Canal falls
 - (iii) Causes of water logging
 - (iv) Balancing depth of canal
 - (v) Head Regulator
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