Notes by-

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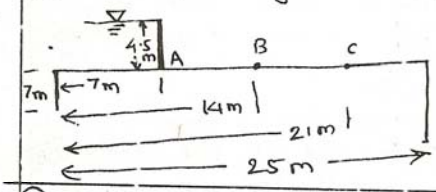
Spillways ; Diversion Headwork : Canals.

(1) Following data were recorded from an ogee spillway :- i) Max. reservoir level = 252.0m ii) Bed level of river = 230.0m iii) Highest flood level downstream = 235.00m iv) Max. flood discharge = 5000 cumec v) Effective length of spillway = 400m vi) Coefficient $C = 2.1\ m^{1/2}/s$ Determine the RL of the crest of spillway. What type of energy dissipator will you recommend? Assume that there is no loss of head in flow over spillway upto the foot of the spillway. [Ans: 248.715m ; USBR Type III]

(2) Find the length of spillway from following data i) Height of spillway crest from river bed. = 100m ii) Discharge = $8500\ m^3/s$ iii) Permissible level of submergence above FRL = 10m iv) Maximum permissible span (clear) = 12.5m v) Thickness of each pier = 3m. Piers and abutments are rounded type. [Ans = Provide bays, with clear span 11.55m, L=178.6m]

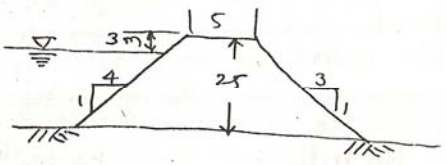
(3) A section of hydraulic structure founded on a sand bed is shown in Fig. Estimate the average hydraulic gradient. Determine the uplift pressures at points 7m, 14m and 21m from u/s end of floor and propose thickness of the floor at these points.



(4) Find the discharge in a canal with the following details i) Bed Slope = 1 in 3600 ii) Side slopes = 1:1 (iii) Depth of flow = 1.0m (iv) Coeff. of rugosity = 0.020 (v) B/D ratio = 4.

(5) An irrigation canal passing through an alluvial soil is to be designed according to Lacey's silt theory for the following data. i) Full Supply Discharge = $10.5\ m^3/s$ ii) Lacey's silt factor = 1.0 iii) Side Slope of the canal = $\frac{1}{2}H:1V$ Find the geometric parameters of the canal.

(6) The figure shows the section of homogeneous earthen dam Properties of soil mass used in the construction are as follows (i) Saturated unit weight = $21.60\ kN/m^3$ (ii) Submerged unit weight = $11.60\ kN/m^3$ (iii) Angle of internal friction = 30° (v) Cohesion = $40\ kN/m^2$



(7) What structure you propose for crossing of a canal with natural drainage with following data. (i) Nala Bed Level = 99.00m (ii) HFL in Nala = 100.50m (iii) Catchment area = $2\ km^2$ (iv) Canal bed level = 100.00m (v) FSL of canal = 103.00 (vi) Free board = 0.90m (vii) Canal discharge = 20 cumecs. Sketch the proposed structure.

(8) Suggest suitable methods of energy dissipation below a spillway for the following flow conditions. (i) The jump height curve (JHS) is above the tail water curve (TWC) for all the discharges (ii) the jump height curve (JHC) is above the tail water curve (TWC) at low discharges and below it at high discharges.

(9) Using WES formula design the crest and d/s profile of a high ogee spillway for a design head of 15.5m and d/s face slope of 0.7H:1V. Propose a suitable energy dissipation device for the same.

(10) Find the crest and bottom widths required for a vertical drop weir with the following data ① Height of weir = 10m ; ② Pond Level = 1m above crest ③ u/s HFL 2m above crest. ④ d/s HFL = 0.5 below crest

Ans: [Crest width = 2m, Bottom Width = 4m if u/s face is vertical and 5m if both faces have same slope]