



Answer all the following questions :- (Assuming any missing data)

1) What are the principles elements of large embankment dams design and the failure modes explain your answer by net sketches.

2) The outline profile of an earthfill embankment is illustrated in Fig. The foundation alluvium

has a permeability (anisotropic) of $k_h = 2k_v = 1 \times 10^{-5} \text{ ms}^{-1}$. The design

effective permeability of the grouted cut-off zone, $k_c = 2.35 \times 10^{-7} \text{ ms}^{-1}$. Draw the foundation flownet without a grouted cut-off in position

take the number of potential drop equal 25 and the number of flow channel equal 4 and calculate seepage flow, Q_0 , in $\text{m}^3 \text{ m}^{-1} \text{ day}^{-1}$. Determine the width, t , of grouted cut-off zone required to achieve a design E_Q of 65% and compute the corresponding value of E_H .

3) Define the condition of structural equilibrium of concrete dam explain your answer by equations?

4) The profile of an old concrete gravity dam is shown in Fig. The structural competence of the dam is to be reviewed in relation to planned remedial work.

Design criteria. Normal load combination (NLC):
water load (to design flood level (DFL))+self-weight
+ uplift + silt. Uplift: no provision in original design.
Sediment: friction angle, $\phi_s = 30^\circ$; submerged unit weight: $\gamma'_s = 15 \text{ kNm}^{-3}$.

Concrete characteristics: core samples. Unit weight, $\gamma_c = 24 \text{ kNm}^{-3}$; unit shear resistance, $c = 600 \text{ kNm}^{-2}$; angle of shearing resistance, $\phi_c = 35^\circ$.

* Analyze the stability of the profile with respect to plane X-X for the NLC, using shear friction factor, F_{SF} , for sliding stability.

* Determine the vertical normal stresses and major principal stresses at either face.

5) What is the mean of inland waterways, mention their types and utilization?

6) A navigation lock, $300 \text{ m} \times 15 \text{ m}$ in plan and with a 10.00 m head, is filled through two longitudinal conduits with rectangular gates 4.00 m wide controlling the flow. The overall coefficient of discharge of the filling system is 0.75 and the gates open 12 mms^{-1} at a uniform speed in 6 min . Determine the maximum discharge entering the lock and the total time of filling.

