

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 100852

Roll No.

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B.TECH.

Theory Examination (Semester-VIII) 2015-16

ANALYSIS & DESIGN OF HYDRAULIC STRUCTURES

Time : 3 Hours

Max. Marks : 100

- Note :** 1. This question paper has three Sections A, B and C. Marks and number of questions to be attempted from each section is mentioned before the section.
2. Use of Khosla's chart is permitted'
3. Use illustrations, wherever required. Assume missing data suitably, if required.

Section-A

1. **Attempt all parts. All parts carry equal marks. Write answer of each part in short.** (2×10 = 20)
- (a) Differentiate between a distributary head regulator and cross regulator with neat sketch only.

- (b) Differentiate between a weir and barrage.
- (c) Explain the difference between silt excluder and silt ejector.
- (d) Why are the canal falls are constructed in an irrigation canal?
- (e) A flow net is plotted for a homogeneous earth dam of 27m height with a free board of 2m. The numbers of flow channels are 8. If the coefficient of permeability of the dam is 3×10^{-5} m/s respectively. Determine the number of potential drops for the given discharge of 70×10^{-6} cumecs/m run of the dam.
- (f) What is the function of drainage gallery provided in a gravity dam?
- (g) Find the width of elementary gravity dam, whose height is 80m. It is given:

Specific gravity of dam material (G) = 2.22, and uplift or seepage coefficient (c) = 0.82

- (h) Define capacity factor and plant use factor.

- (i) Which type of the turbine will be suitable to generate 8000 H.P. under a head of 80 m while working at a speed of 400 rpm.
- (j) Compute the discharge over an ogee spillway with a coefficient of discharge $C=2.5$ at a head of 4 m. The effective length of spillway is 144m. Neglect velocity of approach.

Section-B

2. Attempt any FIVE parts from the followings: (10×5=50)

- (a) Explain Khosla's exit gradient concept. Enlist and explain the various corrections proposed by Khosla.
- (b) Discuss the classification of various types of cross-drainage works on the basis of relative levels and discharges with neat sketches.
- (c) Write short notes on the followings:
 - (i) Fish Ladder: function and necessity
 - (ii) Canal escape : types and necessity

- (d) What do you understand by flood routing? Differentiate between Hydraulic and hydrologic flood routing. Explain the continuity equation used in hydrologic routing.
- (e) A Sarda fall is to be designed for a drop of 1.25 m in a channel 20 m wide and carrying 18 cumecs of water discharge at a depth of 1.5 m. Calculate the crest dimensions and minimum length of floor to be provided on downstream.
- (f) A gravity dam has the following dimensions: height of dam = 101.5m. Free Board = 1.5 m. Slope of u/s face = 0.15:1. The uniform value of horizontal acceleration coefficient (α_h) as 0.10. Determine its ratio of hydrodynamic moments at the joints situated 53m and 83m below maximum water surface.
- (g) An impounding reservoir had original storage capacity for 738 ha-m. The drainage area of the reservoir is 80 km² from which, annual sediment discharges into the reservoir at the rate of 0.01150 ha-m km² of the drainage area. Assuming the trap efficiency as 75%. find the annual capacity loss of reservoir in % per year.

- (h) The main canal from the headwork of a dam has been designed to carry a discharge of 45 cumecs. At a certain location a drop of 4.4m head is provided to generate the hydro-power. Estimate how much kW of energy can be generated. The machinery efficiency may be assumed as 78%.

Section-C

Note: Attempt any TWO parts from the following:

(15×2 = 30)

3. Explain the various types of hydraulic and seepage failures in earth dams with neat sketches.
4. Differentiate between Jump Height Curve (JHC) and Tail Water Curve (TWC) Plot the five relative conditions of J.H.C. with T.W.C. Suggest at least two suitable protection works with neat sketches for each of the following condition
- (i) when J.H.C. lies above T.W.C
- (ii) when J.H.C. coincides with T.W.C. at all discharges.

5. A weir across an alluvial river has a horizontal floor of length of 60 m and retains 6 m of water under full pond condition. If the downstream sheet pile is driven to a depth of 6 m below the average bed level. Calculate the exit gradient. Also, find the critical exit gradient and the factor of safety of the system with respect to the exit gradient, if the porosity of soil and relative density of soil particles is assumed to be 32% and 2.7 respectively.

