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

PAPER ID : 100852 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VIII) THEORY EXAMINATION 2013-14

ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

Time : 3 Hours *Total Marks : 100*

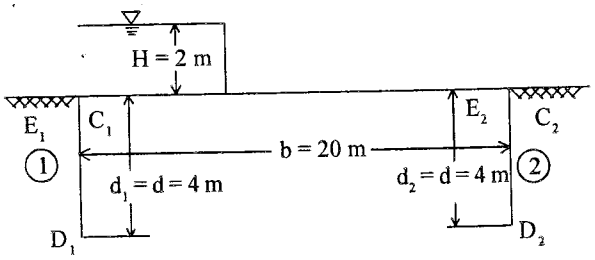
Note :– (1) Attempt all questions. Use illustrations wherever required.

(2) Assume missing data suitably, if any.

(3) Use of Khosla's chart is permitted.

1. Attempt any **two** parts of the following : **(10×2=20)**

(a) For the impervious floor as shown in figure 1, determine the uplift pressure at points C_1 and E_2



use analytical approach as suggested by Khosla's theory.

(b) (i) Compute the maximum flood discharge which can safely pass over the weir without exceeding the full

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reservoir level. Neglect velocity of approach. The data for the weir is given below :

Total no. of vertical gates =55

span of each gate = 10 m

u/s full reservoir level = 110 m

crest level = 106 m.

coefficient of end contraction for piers = 0.02

coefficient of discharge cd = 1.7 $m^{1/2}$/sec

Use Francis formula $Q=1.70\ LeH^{3/2}$

(ii) Explain with neat sketch, difference between weir and barrage.

(c) Write short notes on any **two** of the following :

(i) Meter and non-meter falls.

(ii) Design principle of canal head regulator.

(iii) Khosla's exit gradient concept.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Differentiate between (with neat sketches)

(i) Aqueduct and Superpassage.

(ii) Syphon aqueduct and Canal syphon.

(b) Explain the functions and purposes of the following with neat sketches.

(i) Divide wall

(ii) Fish ladder

(iii) Scouring sluices.

(c) Design and sketch the expansion and contraction transition for the data given below :

Original canal width = 20 m

Flumed canal width = 10 m

Total length of expansion transition = 15 m

Total length of contraction transition = 10 m

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3. Attempt any **four** parts of the following : **(4×5=20)**

(a) A flow net is plotted for a homogenous earthen dam of 30m height with a free board of 5m. The number of potential drops are 10. The permeability in horizontal and vertical direction are 3×10^{-4} cm/sec and 2×10^{-4} m/sec . Determine the number of flow channels for the given discharge of 72×10^{-6} m^3/sec per meter run of dam.

(b) How will you determine the phreatic line for a homogenous dam provided with a horizontal filter.

(c) Enlist the various causes of failure of earth dam. Explain the various types of hydraulic failures.

(d) Explain the various storage zones of a multipurpose reservoir with neat sketch.

(e) What do you understand by reservoir sedimentation and reservoir losses ? How will you control the reservoir losses ?

(f) What do you understand by "Flood routing through reservoir" ? Explain step by step procedure to solve the basic flood routing equation by any one method.

4. Attempt any **four** parts of the following : **(4×5=20)**

(a) Find the width of elementary gravity dam whose height is 90 m. Given specific gravity of dam material (G) = 2.2 and Uplift or Sepage coefficient (C) = 0.8

(b) Differentiate between a low and high gravity dam.

(c) What do you understand by galleries ? Why are they provided in gravity dams ?

(d) Explain the U.S.B.R recommendations for determining uplift pressure under the base of a dam, provided with a drainage gallery.

(e) How do you control cracking in a concrete gravity dam ?

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(f) A masonary dam 6 m high is 1.5 m wide at top and 4.5 m wide at the bottom, with vertical water face. Determine the normal stresses at the toe and heel for reservoir full condition.

Take specific gravity of dam material = 2.4 and coefficient of uplift (c) = 1.0

5. Attempt any **two** parts of the following : **(2×10=20)**

(a) Water emerges from a spillway with a velocity of 15 m/sec and a depth of 0.5 m . Calculate the necessary subcritical depth at the toe of the spillway for the occurrence of a hydraulic jump. Also calculate the energy loss incurred.

(b) (i) Enumerate principle components of a hydraulic scheme with neat sketch.

(ii) Give the classification of Hydro-power plants on the basis of operating head on turbines.

(c) Explain the following terms :

(i) Load factor

(ii) Trash rack

(iii) Priming of siphon spillway

(iv) Spillway Crest Gates

(v) Draft tube