

Code : 011725

B.Tech 7th Semester Examination, 2016

Design of Hydraulic Structures

Time : 3 hours

Full Marks : 70

Instructions :

- (i) *There are Nine Questions in this Paper.*
- (ii) *Attempt Five questions in all.*
- (iii) *Question No. 1 is Compulsory.*
- (iv) *The marks are indicated in the right-hand margin.*

1. Choose the correct answer (any seven) 2×7=14
- (a) Canal drops are required to:
- (i) dissipate excess energy
 - (ii) dissipate inadequate land slope
 - (iii) dissipate excess land slope
 - (iv) none of above
- (b) An Inglis fall, also called a Baffle fall, can be recommended for all discharges, provided:
- (i) The fall is more than 1.5 m.
 - (ii) the fall is undrowned
 - (iii) the fall is either flumed or unflumed
 - (iv) all of the above

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(c) The canal regulator, which is constructed at a diversion head-works, is called a:

- (i) cross regulator
 - (ii) distributary head regulator
 - (iii) canal module
 - (iv) none of the above
- (d) Khosla's theory of independent variables is used in the design of:
- (i) weirs and barrages
 - (ii) cross regulators and head regulators
 - (iii) modules
 - (iv) all the above
- (e) Economic height of the dam is that height, for which the:
- (i) cost per unit of storage is minimum
 - (ii) benefit cost ratio is maximum
 - (iii) net benefits are maximum
 - (iv) none of above
- (f) Leakage through the transverse joints in a gravity dam, is prevented by:
- (i) shear keys
 - (ii) key ways
 - (iii) water stops

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(iv) none of these

(g) The channel constructed to bypass the excess water entering a canal, is called a :

(i) canal module

(ii) canal siphon

(iii) canal escape

(iv) canal regulator, canal escape

(h) Earthen Dam are:

(i) rigid dams

(ii) non-rigid dams

(iii) over flow dams

(iv) diversion dams

(i) Bank storage in a dam reservoir:

(i) increases the computed reservoir capacity

(ii) decreases the computed reservoir capacity

(iii) sometimes increases and sometimes decreases the computed reservoir capacity

(iv) has no effect on computed reservoir capacity

(j) An irrigation outlet is said to be proportional, when its:

(i) sensitivity = 1

(ii) flexibility = 1

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(iii) setting = 1

(iv) all the above

2. (a) Illustrate with neat sketches the following parts of an earthen dam and state their functions briefly:

(i) Rock toe

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(ii) horizontal drainage blanket

(iii) cut-off

(iv) Rip-rap

(b) Differentiate between a Low gravity dam and a High gravity dam.

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3. In order to determine the factor of safety of the d/s slope during steady seepage, the section of a homogeneous earth dam was drawn to scale of 1 cm = 10 m, and the following results were obtained on a trial slip circle.

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Area of N-Diagram = 12.15 sq.m

Area of T-Diagram = 6.50 sq.m

Area of U-Diagram = 4.2 sq.m

length of Arc = 11.60 m

The dam material has following properties

Effective angle of internal friction = 26°

Unit of cohesion = 2 t/m^2

Unit weight of soil = 2 t/m^2

Determine the factor of safety of slope.

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4. (a) Suggest suitable cross-drainage works at the following crossings: 7

(a) Irrigation channel

Discharge = 350 cumecs

Bed width = 28 m

(b) Natural Drainage

HFQ=4300 cumecs

Drainage bed level = 194.9 m

FSD = 6.2 m HFL=198.5 m

FSL = 204.3 m

CBL = 198.1m

Natural ground level = 179.5

(b) What is meant by Canal Escapes? How do they help in protecting the adjoining areas against flooding due to some breach in the canal embankment? 7

5. (a) What are the different types of cross drainage works that are necessary on a canal alignment? State briefly the conditions under which each one is used? 7

(b) State under what circumstances you will recommend use of the following cross drainage structures: 7

(i) Syphon

(ii) Inlet

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(iii) Aqueduct

6. (a) Following data were observed in a canal: 8

Fully supply level = 115 m

Bed Level Canal = 112 m

Bed width of canal = 15 m

Fully supply discharge = 30 cumecs

Side slope of canal = 2H: 1V

Length of crest of the fall = 10 m (crest section is rectangular)

Coefficient of discharge over crest = $1.7 \text{ m}^{1/2}/\text{Sec}$
calculate the crest level

(b) What are the different type of earthen dams that are usually adopted. State where each type is adopted? What are the causes of failures of earth dam? 6

7. (a) What is meant by canal regulation? Enumerate the different engineering structures which may be required to be constructed in a canal project in order to regulate effectively the functioning of the different canals of a canal system? Discuss briefly the necessity, design and other details of any two such regulation work. 14

8. Design a suitable cross drainage work, given the following data 14

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(a) Irrigation channel

FSQ = 354 cumecs

Bed Width = 24 m

FSL = 207.6 m

CBL = 201.4 m

Side Slopes = 1/2H:1V

(b) Natural Drainage

HFQ = 600 cumecs.

Drainage bed level = 203.6 m

HFL = 206.3 m

9. (a) What do you mean by the elementary profile of a gravity dam? What are the advantages and disadvantages of a gravity dam over other types?

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(b) Explain why trapezoidal notches are preferred to rectangular notches in the design of canal drops.

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