Code : 011725

B.Tech 7th Semester Exam., 2017

DESIGN OF HYDRAULIC STRUCTURES

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. 1 is compulsory.

1. Choose the correct option from the following (any *seven*) : 2×7=14

(a) In a trapezoidal channel having side slope m : 1, flow depth = D, longitudinal slope = S_0, the maximum shear stress on the sides is about

(i) γDS_0

(ii) $0 \cdot 99 \gamma DS_0$

(iii) $0 \cdot 75 \gamma DS_0$

(iv) $(1/m)\gamma DS_0$

(b) Masonry or concrete sloping weirs are suitable for soft sandy foundations.

(i) True

(ii) False

(c) Under tunnels have a capacity of

(i) 20% of canal discharge

(ii) 10% of canal discharge

(iii) 30% of canal discharge

(iv) None of the above

(d) Silt excluder is called as

(i) curative measure

(ii) preventive measure

(iii) both measures

(iv) None of the above

(e) A structure in which the drain is taken over a canal is called

(i) aqueduct

(ii) canal-syphon

(iii) syphon aqueduct

(iv) superpassage

(f) In a Sarda type fall, rectangular crest is designed for discharge

(i) up to 14 m^3/s

(ii) > 14 m^3/s

(iii) up to 5 m^3/s

(iv) Unlimited

(g) Gibbs' module is a type of outlet, which ensures

(i) constant discharge even if the water levels in the supply channel and water course fluctuate

(ii) variable discharge as per need

(iii) constant discharge into the water-course when the water levels in the supply channel vary

(iv) constant discharge for varying water levels in the watercourse for a given water level in the supply channel

(h) Minimum modular head is defined as

(i) the ratio of the head recovered to the input head

(ii) range between lowest and highest limiting values of variables

(iii) extreme values of any variable beyond which an outlet is unable to act as a module

(iv) minimum difference between upstream and downstream water levels required by the module to pass the designed discharge

(i) The overflow dam is a/an

(i) gravity dam

(ii) earthen dam

(iii) weir

(iv) None of the above

(j) Basic seismic coefficient for zone IV is given by

(i) 0·04

(ii) 0·02

(iii) 0·05

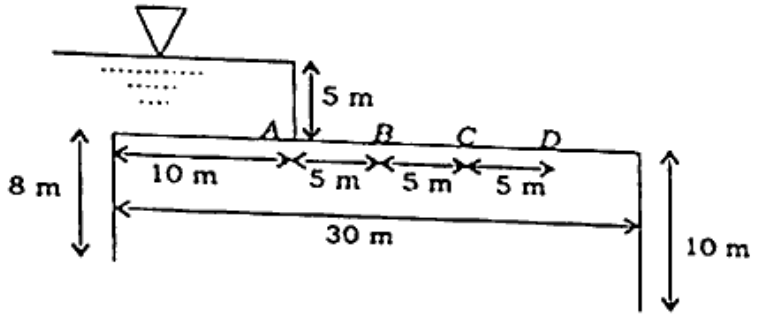
(iv) None of the above

2. (a) Explain tractive force approach for design of non-erodible channel. 6

(b) A wide rectangular channel carries clear water at a depth of 1·2 m. The channel bed is composed of coarse gravel of d_{50} = 40 mm. Determine the slope of the channel at which incipient conditions exists. What is the discharge per unit width at this slope? 8

3. Draw a neat layout of a diversion headwork and indicate its various components. Briefly indicate the function of each component. 14

4. Calculate the average hydraulic gradient in a section of a hydraulic structure as shown below. Also find the uplift pressures at points *A*, *B*, *C* and *D*. Find the thickness of the floor at these points, take $\rho = 2 \cdot 24$: 14



5. What are different types of weirs? Explain with neat sketches, circumstances under which each type is adopted. 14

6. *(a)* What are different types of earth dams? Explain any one of them. 6

(b) Design an elementary profile of a gravity dam of height 50 m plus the freeboard. Convert it into a practical profile. 8

7. Fix suitable values for waterway, crest levels of weir and under sluices portions for the following data :

HFD = 10000 m^3 /s, RBL = 200·0 m,
HFL = 206·0 m, $f = 1$, afflux = 1·0 m
Check for maximum flood. 14

8. *(a)* What are different types of cross-drainage works that are necessary on a canal alignment? State briefly the conditions under which each one is used. 8

(b) Enumerate the steps of design for an aqueduct for the Barrel size, Transition of canal and Levels of trough. 6

9 Write notes on any *three* of the following : 14

(a) Exit gradient and its importance

(b) Canal escapes

(c) Modules

(d) Lock in navigation canal

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