Code No: 157CH

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, July/August - 2023
IRRIGATION AND HYDRAULIC STRUCTURES
(Civil Engineering)

Time: 3 Hours **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Enumerate factors considered for selection of site of a reservoir. [2]
b) What are different types of dams? Explain the criteria used for selection of type of a dam. [3]
c) Differentiate between elementary and practical profile of gravity dam. [2]
d) Write a note on foundation of gravity dams. [3]
e) Explain the causes for failure of earthen dams. [2]
f) What is pore pressure and its significance in relation to earthen dam construction? [3]
g) Differentiate between weir and barrage. [2]
h) What are creep theories what is their importance? [3]
i) What are design considerations for cross drainage works? [2]
j) What do you mean by canal outlets? Sketch one of them. [3]

PART – B

(50 Marks)

2.a) With help of a sketch indicate zones in a reservoir, explain their importance.
b) The monthly flows of a river during a given below. Determine the active storage capacity of a reservoir (as $\times 10^6$ m^3) to be constructed on this river for 10.5 m^3/s water supply for each month in June, July, August and September and 7.5 m^3/s water supply for each month in the others. [5+5]

Month	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Inflow Mm^3	10	3	10	6	14	15	6	6	10	9	4	9

OR

3.a) What is life of a reservoir? Discuss factors affecting life of a reservoir.
b) Using the data given in the table, Find the probable life of the reservoir with an initial reservoir capacity of 30 Mm^o, if the annual flood inflow is 60 Mm^3 and the average annual sediment inflow is 3600,000 kN, Assume a specific weight of a sediment equal to 12 kN/m^2. The useful life of the reservoir will terminate when 80% of the initial capacity is filled with sediment. [5+5]

Capacity Inflow ratio	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Trap Efficiency	87.1	93.4	95.2	95.9	96	96.5	97.1	97.4	97.6	97.9

4.a) Explain the causes for failure of gravity dams and suggest precautions to control failure.

b) A concrete dam 15 m high is trapezoidal in section with a top width of 1m and bottom width of 8.25m. The upstream face has a batter of 1:15. The water is stored up to 15m height. There is no downstream water. Find the factor of safety against sliding. Consider water force, self-weight and full uplift pressure. Assume unit weight of concrete and water suitably.[5+5]

OR

5. Find the maximum and minimum vertical stresses at heel and toe, major principal stresses at toe and intensity of shear stress on a horizontal plane near toe of the dam.
Take unit weight of dam material = 24 KN /m^3. Top width = 8 m and bottom width = 24 m. Allowable stress in concrete 2500 KN /m^3. [10]

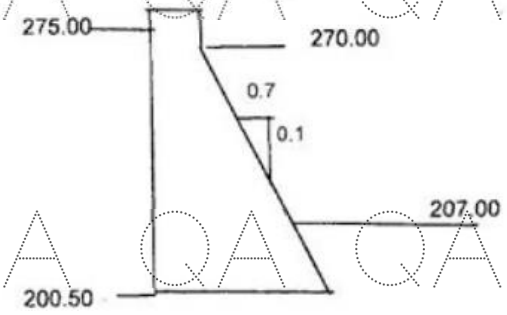

Figure 1

6.a) Explain the precautions and remedial measures you would undertake to control the seepage through i) earthen dam body ii) through the dam foundation.

b) A section of a homogeneous earth dam is shown in Figure 2. Calculate the seepage discharge per metre length, through the body of the dam. The coefficient of permeability of the dam material may be taken as 8×10^{-5} m/sec. [5+5]

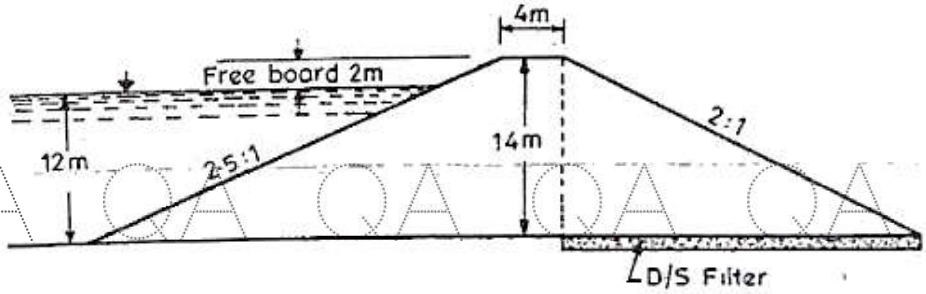

Figure 2

OR

7.a) With help of a sketch explain the components. Also present a detailed classification of spillways.

b) An ogee spillway with H 30 m and total head h 5 is shown in figure 3. The downstream channel is a horizontal rectangular channel. It is assumed the tail water depth (y_t) is the same with the conjugate depth (y_2) Given discharge coefficient 2.04 $m^{0.5}/s$, calculate
i) the unit discharge from the spillway;
ii) the downstream water depth (y_1) before the hydraulic jump; and iii) the energy loss due to the hydraulic jump. [5+5]

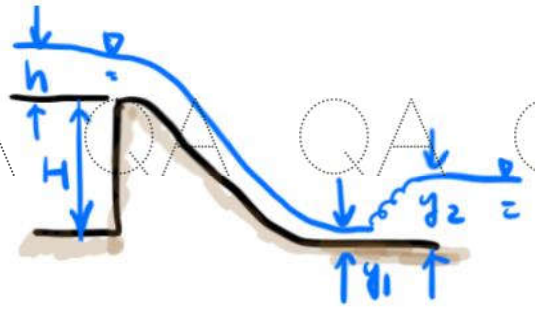

Figure 3

8.a) Present the layout of diversion head work indicating the components and their purpose.

b) Discuss the causes for failure of Weirs and Barrages on permeable foundations. [5+5]

OR

9.a) Explain the design principles of weirs on permeable foundations using Creep theories.

b) A weir on a permeable foundation with downstream sheet pile is shown in the figure 4. Find the exit gradient as per Khosla's method. [5+5]

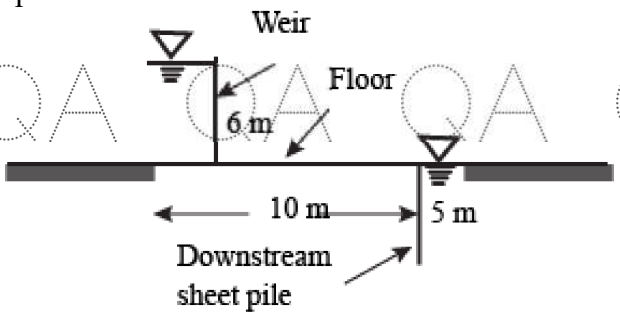

Figure 4

10. Design a suitable fall structure over an irrigation canal (Hydraulic Design only) for the following set of data:
Full Supply Discharge 834m^3/s
Canal Bed width 20 m
U/S full supply level 414 m
D/S full supply level 412. m
U/S bed level 412.8 m
D/S bed level 411.3 m
Natural surface level 4128m
Bligh's coefficient 7
Present line sketch of the designed values. [10]

OR

11.a) Present a detailed classification of cross drainage works along with line sketches.

b) Explain the design principles of cross and distributary head regulator. [5+5]

---ooOoo---