Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: RCI6C002

6th Semester Regular/Back Examination: 2024-25
SUBJECT: HYDROLOGY & IRRIGATION ENGINEERING
BRANCH(S): CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: S173

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Name the type of data recorded by a tipping-bucket rain gauge. How does it differ from a weighing-bucket rain gauge?
b) Classify streams based on flow characteristics and give one example of each type.
c) List any three physical or climatic factors influencing the shape of a hydrograph.
d) What do you mean by basin lag? How does it affect flood response?
e) Define intensity of irrigation. How is it related to GCA and CCA?
f) What is the purpose of plotting a flow net in seepage analysis?
g) Give two key design differences between a high dam and a low dam.
h) Why is a divide wall important in diversion headworks? Mention any one function.
i) How does a drainage gallery improve the safety of a gravity dam?
j) Mention the formula linking duty, delta, and base period. List one factor affecting duty.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Describe the hydrologic cycle with a neat sketch. Mention any three key processes involved.
b) What is a runoff hydrograph? Discuss the influence of catchment characteristics and rainfall duration on its shape.
c) Explain the concept of design flood and probable maximum flood. Where are these used in hydraulic engineering?
d) Compare and contrast Bligh's creep theory and Khosla's theory in designing safe hydraulic structures.
e) Define the phi-index. How is it useful in separating rainfall excess from total rainfall? Illustrate with a basic example.
f) Draw the layout of diversion headworks and explain the role of each component in sediment control and flow division.
g) List different types of earthen dams. On what basis is a preliminary dam section chosen for a given site condition?

h) Differentiate between water conveyance efficiency and water distribution efficiency. How do they affect irrigation performance?

i) State Horton's infiltration equation. Describe how a double-ring infiltrometer is used to determine infiltration rate.

j) Describe any two types of canal falls with neat sketches. What are their functional differences?

k) Discuss how a mass curve is used in estimating reservoir storage capacity. Show with a sketch and explanation.

l) A storm over a 450 ha watershed resulted in 0.37 Mm^3 of direct runoff. Using a rainfall mass curve, outline steps to calculate the φ-index and excess rainfall duration.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 **(a)** Determine the best values of the parameters of Horton's infiltration capacity equation for the following data on soil infiltration tests using a double-ring Infiltrometer. **(8)**

Time since start (minutes)	5	10	15	25	40	60	75	90	110	130
Cumulative Infiltration (mm)	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0

(b) Explain the process of estimating evaporation losses from large water bodies. Discuss any one method, such as the Penman-Monteith method, in detail, highlighting its advantages and limitations. **(8)**

Q4 **(a)** After how many days a crop will be required to supply water to have sufficient irrigation with the following data: The field capacity of the soil = 34%, Permanent wilting point = 15%, Dry unit weight of soil = 11 kN/m^3, Effective depth of root zone = 850 cm, Daily consumption of water for the given crop = 14 mm. **(8)**

(b) Explain the cost-benefit analysis carried out in justifying the lining of the canal. **(8)**

Q5 **(a)** Design a triangular concrete-lined channel to carry a discharge of 20 cumecs at a slope of 10 cm/km. The side slope of the channel is 1.25:1. Consider Manning's roughness coefficient (n) is 0.03. **(8)**

(b) With the help of a labeled diagram, explain different types of cross-drainage works. Discuss how the selection of a particular type depends on topography and discharge conditions. **(8)**

Q6 Draw the elementary profile of a gravity dam and explain various forces acting on it. A 100 m height concrete gravity dam trapezoidal in cross-section has upstream face vertical, crest width 6 m, base width 75 m and free board equal to 4 m. Calculate the maximum principal stress at the toe when the reservoir is full. Take unit weight of concrete as 23.5 KN/m^3. Consider only self-weight, hydrostatic water pressure, uplift pressure. There is no drainage gallery and tail water. **(16)**