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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech V SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024

Regulation: UG20

HYDROLOGY AND WATER RESOURCES ENGINEERING

Time: 3 Hours

(CIVIL ENGINEERING)

Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

- State precipitation and several forms of precipitation. Explain in brief about measurement of precipitation with its limitations and their applications. [BL: Understand| CO: 1|Marks: 7]
 - The mean annual rainfall in mm at 4 rain gauge stations in catchment area are 1050, 790, 700 and 660. If error in estimation of mean rainfall not exceeded 10%. Determine the additional number of rain gauges needed. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

- Write about infiltration and its significance in environmental studies. Discuss various methods of measurement of infiltration and factors influencing these methods. [BL: Understand| CO: 2|Marks: 7]
 - In a 10 hr storm rainfall depths occurred over a catchment data is given in Table 1. Surface runoff resulting from the storm is equivalent to 20cm of depth over the catchment. Determine
 - Average infiltration
 - Average rate of infiltration
 [BL: Apply| CO: 2|Marks: 7]

Table 1

hours	1	2	3	4	5	6	7	8	9	10
Depths(cm/hr)	1	1.5	5	6	10.5	8.5	9	7	1.5	1.5

MODULE – III

- Mention the factors affecting runoff hydrograph and explain how hydrograph analysis helps in flood forecasting and mitigation? [BL: Understand| CO: 3|Marks: 7]
 - A drainage basin has the following characteristics. Basin area = 100 sq.m. Length of the main stream $L = 18$ m. Distance from the centroid of the basin to outlet = 10 m. Construct the 4 hour synthetic unit hydrograph for the basin if $C_t = 1.8$ and $C_p = 0.6$. [BL: Apply| CO: 3|Marks: 7]
- Describe the concept of equilibrium equations for confined and unconfined aquifers and state the key difference between them. [BL: Understand| CO: 4|Marks: 7]

- (b) Calculate the diameter of the well that will have a discharge of 300 litre/sec with a drawdown of 6m in an unconfined aquifer of thickness of 40m. The radius of influence is 300m and the coefficient of permeability is 100m/day. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Discuss the various merits and demerits of irrigation. Explain about consumptive and non-consumptive use of water. [BL: Understand| CO: 5|Marks: 7]
- (b) The following data given in Table 2 are the details of various crops grown in culturable area of 2000 hectares. Determine the discharge. [BL: Apply| CO: 5|Marks: 7]

Table 2

Sr. No.	Crop	Intensity of irrigation (%)	Kor period(days)	Kor depth(cm)
1	Wheat	40%	16	15
2	Jowar	50%	10	12

6. (a) Compare and contrast the Kennedy's and Lacey's theory. Analyze the impact of various channel parameters on the design outcomes. [BL: Understand| CO: 5|Marks: 7]
- (b) Design an irrigation channel to carry 40 cumecs of discharge with B/D i.e. width to depth ratio as 2.5. The critical velocity ratio is 1.0. Assume a suitable value of Kutter's coefficient and use Kennedy's method. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Summarize about gravity dam and causes of failure. Compare the suitability of gravity dams with other dams. [BL: Understand| CO: 6|Marks: 7]
- (b) Design an overflow spillway section for a design discharge of 1500 m³/sec. the upstream water surface level is at elevation 240m and the upstream channel floor is at 200m the spillway, having a vertical face, is 50m long. [BL: Apply| CO: 6|Marks: 7]
8. (a) Elucidate about reservoirs and its components. Discuss how the components function to ensure safety of the reservoir. [BL: Understand| CO: 6|Marks: 7]
- (b) The Figure 1 shows the section of a gravity dam (non-overflow portion) built of concrete. Calculate major principal stress at the toe of the dam. [BL: Apply| CO: 6|Marks: 7]

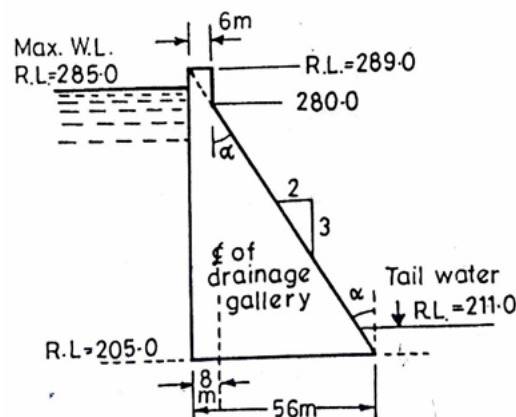


Figure 1