



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Civil Engineering

Semester End Examination; May/June - 2019

Irrigation Engineering

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. Define Consumptive use. What are the factors which influences Consumptive use of water? How it is related to total requirement of water for the crop? 6
- b. Compute the depth and frequency of irrigation required for a certain crop. If root zone depth = 100 cm, field capacity = 22%, Wilting point = 12%, Specific gravity of soil = 1.5 gm/cc, Consumptive use = 25 mm/day and efficiency of irrigation is 50%. Assume 50% depletion of available moisture before application of irrigation water at field capacity. 8
- c. Define Duty in irrigation system. Mention the factor affecting duty. Explain any two of them. 6
- 2 a. A stream of 125 lit/s was diverted from a canal and 100 lit/s were delivered to field. An area of 1.6 hectare was irrigated in 8 hr. Effective depth of root zone was 1.7 m. Runoff loss in the field was 420 Cum. The depth of water penetration varied linearly from 1.7 m at head end of field to 1.3 m at tail end. Available moisture holding of soil is 20 cm per metre depth. Determine water conveyance, water application, and water storage and distribution efficiencies. The irrigation was started at a moisture extraction level of 50% of available moisture. 12
- b. What are the various types of irrigation? What are the merits and demerits of each? 8

UNIT - II

- 3 a. State Kennedy's silt theory and Lacy's silt theory and distinguish between the two. 8
- b. Design a channel by Kennedy formula, discharge = 15 cumecs, slope = 0.0002, $n = 0.0225$ and $m = 1$ 8
- c. Distinguish between Notch type and Sarda type drop. 4
- 4 a. Define Canal. Explain the various classification of Canal. 10
- b. Design a Canal by Lacy's theory for 40 cumecs discharge and $f = 0.9$. 6
- c. What are the different types of cross drainage work? Discuss the factor governing suitable type of cross drainage work. 4

UNIT - III

- 5 a. With a neat sketch, explain various storage zones of a reservoir. 7
- b. The flow from a certain stream in each successive month are:

Months	1	2	3	4	5	6	7	8	9	10	11	12
Flow (mm ³)	3.0	3.6	6.0	19.6	25.2	25.2	21.6	9.9	7.8	7.2	6.6	6.3

Determine the minimum capacity of the reservoir. If the above water is to be drained off at a uniform rate and none is lost by flow over spillway. 10

- c. Explain the following: 3
- i) Trap efficiency ii) Capacity inflow ratio
- 6 a. The annual runoffs for a catchment of 1700 km² are tabulated below. Draw the Inflow mass curve. What is the average yield from the catchment and what should be live storage capacity of reservoir in order to utilize the storage capacity? 10
- | Year | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 |
|-------------|------|------|------|------|------|------|------|------|
| Runoff (mm) | 985 | 1450 | 1700 | 935 | 962 | 1550 | 1107 | 1320 |
- b. Write the steps involved in the estimation of; 10
- i) Storage capacity of a reservoir using mass curve method
- ii) Maximum yield for a given storage

UNIT - IV

- 7 a. Design practical profile for a gravity dam holding a water depth of 88 m, wave height 2 m, specific gravity of concrete 2.4 and permissible compressive strength of 300 tonne/m², top width of dam is 5 m. 8
- b. Define galleries in gravity dam. Explain the functions for which galleries are provided. 6
- c. Explain the following : 6
- i) Factors governing the selection of dam ii) Forces acting on gravity dam
- 8 a. Determine minimum safe base width of an elementary profile of a gravity dam holding 50 m depth of water, assume specific gravity of dam material as 2.4, uplift factor as 0.4, coefficient of friction between concrete and foundation soil 0.7. Also find out principle and shear stresses at top of dam. 10
- b. Explain the Stability analysis of a gravity dam by analytical method. 6
- c. Difference between; i) High and Low gravity dam ii) Principle and shear stresses 4

UNIT - V

- 9 a. Explain with neat sketch the different types of earth dams. 8
- b. A flownet is plotted for a homogenous earth dam of 22 m and free board 2 m. The result obtained are number of potential drop = 10, Number of flow channel = 4, the dam has a horizontal filter of 30 m length of downstream end and the coefficient of permeability of dam material is 5×10^{-6} m/s. Calculate discharge per metre run of the dam. 4
- c. What are the causes of failure of earth dam? Explain them along with relevant sketches. 8
- 10 a. Discuss various criteria for safe design of an earth dam. 8
- b. Calculate the length and thickness of upstream impervious blanket provided for an earthen dam with the following dimensions. Top width = 5 m, base width = 110 m, free board = 3.5 m, minimum water depth or head = 16.5 m, depth upto the impervious foundation is 26 m, coefficient of permeability of foundation material 32 mm per minute and the desirable reduction in seepage is 85%. Neglect seepage through the blanket. 8
- c. Explain the following: 4
- i) Surplus Escape weir ii) Tank irrigation