CE-604

Dec-25-0224

CE-604 (Hydrology and Water Resources Engineering)

B.Tech. 6th (CBCS)

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note :
i. The Question Paper consists of five sections A, B, C, D and E.
ii. The section - E is compulsory.
iii. The candidate can select one question each from other sections ABCD.

SECTION - A

1. Derive an expression for the water budget equation used in hydrological cycle in case of unsteady flow. A small catchment of area 150 ha received rainfall of 10.5 cm in 90 minutes due to storm. At the outlet of the catchment, stream draining the catchment was dry before the storm and experienced runoff lasting for 10 hours with an average discharge of 1.5 Cumec. The stream was again dry after the runoff event. Calculate

   (a) The amount of water which was not available to runoff due to combined effect of evaporation, infiltration and transpiration. (6)

   (b) What is the ratio of run off to precipitation? (4)

2. What are the different methods for the measurement of precipitation? Explain the limitations of each method in detail. A catchment comprising a square of 14 km side. It has five rain gauge stations A, B, C, D, and E (E station at the centre) with

annual rainfall of 90, 85, 75, 80, and 100 mm respectively. Determine the annual average rainfall over the catchment by Theissen polygon methods. (6+4=10)

SECTION - B

3. Differentiate between infiltration rate and infiltration capacity. The Horton's infiltration equation for a catchment is given as

   $f = 20.5 + 35e^{-5t}$ $f = mm/hr$ and $t = hours$

   If a storm occurs on this catchment with an intensity of 50 mm/hr, then the depth of infiltration for the first 15 minutes will be? Also using the same equation, determine avg. infiltration rate for the first 35 minutes. (3+4+3=10)

4. What do you understand by the flow duration curve? Write down the assumptions, and limitations of the Unit hydrograph. The ordinates of 9 hr UH at an interval of 3 hr are 0, 110, 365, 500, 390, 310, 250, 225, 130, 115, 95, 65, 40, 22, 10 and 0. Derive the flood hydrograph due to a 6-hr storm with rainfall of 2, 6.75, and 3.75 cm during each 3 hr interval. Assume an initial loss of 5 mm and ∅ index 2.5 mm/hr and a constant base flow of 10 cumecs. (2+3+5=10)

SECTION - C

5. Define the trap efficiency of a reservoir. Describe how the time required for the reservoir to fill up with sediments is calculated. Also, explain with a neat sketch of the different storage zones of the reservoir. (2+4+4=10)