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Paper Code : CE(PC)502 Engineering Hydrology

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(i) The stage of river carrying a discharge of Q m3/sec at a point is 10 m and slope of water surface is (1/4000). The discharge of a flood at the same point and same stage of 10 m with a water surface slope of (1/1000) will be

(ii) What is an IUH?

(iii) For an annual flood series arranged in decreasing order of magnitude, the return period for a magnitude listed at position m in a total of N entries is_____

(iv) What is the Muskingum method ?

(v) Symon's rain gauge is a type of _____

(vi) What is an anticyclone?

(vii) Which type of rain gauge is used for measuring rains in remote, hilly inaccessible areas?

(viii) A 6h rainfall of 6 cm at a place A was found to have a return period of 40 years. What is the probability that as a 6h rainfall of this or larger magnitude will occur at least once in 20 successive years ?

(ix) What is a Thiessen polygon ?

(x) What is Potential evapotranspiration ?

(xi) A well having size 7.70 m x 4.65 m in lateritic soil has its normal water level 5.08 m below ground level. After pumping for 1.5 hours, the water level depressed to 5.93 m and pumping was stopped. The water level after 4 hours from time after pumping stopped is 5.68 m. the specific capacity of the well is:

(xii) The point of inflection on the recession limb of a hydrograph represents:_____

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. A catchment has four sub-areas. The annua. precipitation and evaporation from each of the areas are given in table below: [5]
Assume that there is no change in the groundwater storage on an annual basis. Calculate for the whole catchment the values of annual average (i) precipitation and (ii) evaporation. What are the annual runoff co-efficients for the sub-areas and for the total catchment taken as a whole.

Sub-area	Area (Mm^2)	Annual Precipitation (mm)	Annual evaporation (mm)
A	10.7	1030	530
B	3.0	830	438
C	8.2	900	430
D	17.0	1300	600

3. What are the assumptions made in unit hydrograph theory? [5]

4. Define w-index and φ-index. [5]

5. The total rainfall in a catchment of area 1000 km2, during a 6-h storm, is 19 cm. The surface runoff due to this storm computed from triangular direct runoff hydrograph is 1 x 108 m3. Determine the φ index for this storm. [5]

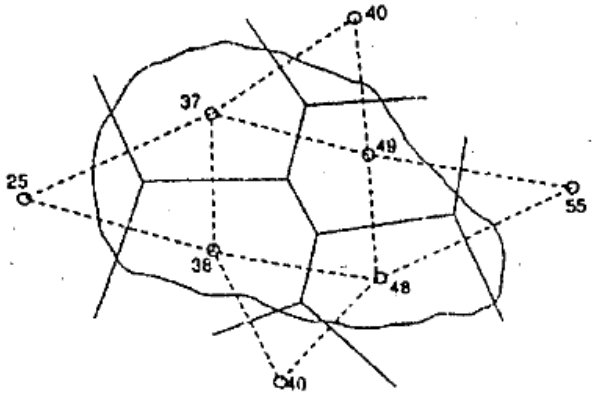
6. A bridge has an expected life of 25 years and is designed for a flood magnitude of return period 100 years. (a) what is the risk of this hydrologic design? (b) if a 10% risk is acceptable, what return period will have to be adopted? [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. Describe the various methods of computing average rainfall over a basin. Discuss the merits and demerits of each one. [5+5+5]

8. Compute the average depth of rainfall for catchment shown in figure with an area of 200 km2, using all the three methods. The rainfall amounts are indicated in mm at the respective gauge sites. Also compute the volume of rain water in m3 received by the catchment area in each case. [5+5+5]



Figure

9. For a river, the estimated flood peaks for two return periods by the use of Gumbel's method, are given below [15]

Returns period (years)	Peak flood (m^3/s)
100	485
50	445

What flood discharge in this river will have return period of 100 years.

10. (a) The inflow hydrograph readings for a stream reach in m3/sec at 12 hour intervals are as follows: 42, 45, 88, 272, 342, 288, 240, 198, 162, 133, 110, 90, 79, 68, 61, 56, 54, 51, 45, 45 and 42. The Muskingum coefficients for the stream reach are k=36 hr and x=0.15. determine the attenuation in peak flow discharge. https://www.makaut.com [8]

(b) Also determine the time of peak outflow [7]

11. (a) On the basis of isopluvial maps, the 50 year-24 hr maximum rainfall at Bangalore is found to be 16 cm. determine the probability of 24 hr rainall of magnitude equal to or greater than 16 cm occurring at bangalore:
At least once in 10 successive years. [5]

(b) Two times in 10 successive years. [5]

(c) Once in 10 successive years. [5]

*** END OF PAPER ***