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320556(20)

B. E. (Fifth Semester) Examination, April-May 2021

(New Scheme)

(Civil Engg. Branch)

ENGINEERING HYDROLOGY

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *All units are compulsory. Part (a) is compulsory carrying 2 marks. Attempt any two question from (b), (c) & (d) of each unit carrying 7 marks.*

Unit-I

1. (a) Which of the following river has the maximum contribution to the base flow?

    (i) Perinnial River

    (ii) Intermittent River

    (iii) Ephemeral River

(iv) All of these

(v) None of these

(b) Discuss migratory systems at any given time in detail.

(c) Explain with example what is meant by general circulation of the earth's atmosphere.

(d) What do you mean by hydrology and what are it's applications in hydraulics, agricultural and water resources of civil engineering.

Unit-II

2. (a) Define and draw typical PMP and IDF curves.

(b) Describe the mechanism and principle with neat sketch of syphon type rain-gauge.

(c) (i) Based on the statistical principle how will you obtain the optimum number of rain gauges. 3

(ii) A catchment has five rain-gauge stations. In a year, the annual rainfall recorded by the gauges are 78·8 cm, 90·2 cm, 98·6 cm, 102·4 cm and 70·4 cm. For a 10% error in the estimation of the mean rainfall, determine the additional number of gauge needed. 4

(d) The shape of a catchment approximately resembles a square of side 8 km. With reference to an X-Y coordinate frame whose origin is coinciding with one of the corners of the catchment the locations of the four corners of the catchment are (0,0), (8,0), (8,8) and (0,8). There are four rain gauges A,B,C and D within this catchment whose positions with reference to the same coordinate frame are (2,2), (6,2), (6,6) and (2,6) respectively. The rainfall recorded by the rain gauge A,B,C and D during a storm are 8,6,9 and 11 cm respectively. Determine the average depth of rainfall over the catchment by appropriate method.

Unit-III

3. (a) Define rate of infiltration and infiltration indices. Also give the unit of infiltration index.

(b) Describe various infiltration equations. Explain how the constants f_c, f_0 and k in the horton's equation can be obtained from the experimental data.

(c) A 6 hr storm produced rainfall intensities of 7, 18, 25, 12, 10 and 3 mm/hr in successive 1 hour interval over a basin of 800 sq.km. The resulting runoff is

observed to be 2640 hectares meter. Determine φ - index and w-index, if the losses are 0·6 cm for the basin.

(d) What does basin yield referto? Give a water balance equation for a basin under consideration.

Unit-IV

4. (a) What do you mean by isolated storm hydrograph and complex storm?

(b) In a typical 6 hr. storm, 4 cm excess rainfall is occurring, the flow recorded in the catchment as shown below. Derive as unit hydrograph for 6 hr. storm. Base flow is 100 cu. meter/sec.

Time (hr)	Observed hydrograph m^3/s
0	100
6	100
12	300
18	700
24	1000
30	800
36	600
42	400

48	300
54	200
60	100
66	100

(c) The ordinates of 4-h U H of a basin of area 300 km^2 measured at 1h intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3 and 1·5 m^3/s respectively. Obtain the ordinates of a 3h U.H. for the basin using the S-curve technique.

(d) Why are base flow separated from total runoff? Describe two methods of separating the base flow from the total runoff.

Unit-V

5. (a) Define and draw aquifer and aquifuge.

(b) Derive an expression for steady state of discharge condition from a well penetrating a confined aquifer.

(c) State Dupuit's assumption for obtaining the confined aquifer general equations governing ground water flow. Derive an expression for unconfined aquifer.

(d) An unconfined aquifer has a thickness of 30 m. A fully penetrating 20 cm, diameter well in this aquifer

is pumped at a rate of 35 lit/s. The drawdown measured in two observational wells located at distances of 10 m and 100 m from the well are 7·5 m and 0·5 m respectively. Determine the average hydraulic conductivity of the aquifer. At what distance from the well the drawdown is in significant.