Code : 011512

B.Tech 5th Semester Exam., 2014

ENGINEERING HYDROLOGY

Time : 3 hours   Full Marks : 70

Instructions:

(i) The marks are indicated in the right-hand margin.

(ii) There are **NINE** questions in this paper.

(iii) Attempt **FIVE** questions in all.

(iv) Question No. **1** is compulsory.

1. Write on any *seven* from the following in short, preferably *1* or *2* sentence(s) each :   14
   Drizzle, initial losses, hydrometry, isochrones, drainage density, double mass curve, reliability, peak attenuation, aquitard, specific yield

2. (a) What are the different methods to convert the point rainfall values into an average value over a catchment? Which method is superior?   6

   (b) The average annual rainfalls of 4 rain gauge stations in a basin are 105, 79, 70 and 66 cm. If the basin mean rainfall is to be estimated within 10 per cent error, determine the additional number of gauges needed.   8

3. (a) Define evapotranspiration and discuss two methods of its estimation.   6

   (b) During a daily routine observation, 10·8 litres of water was added to bring the water surface in the evaporation pan to the stipulated level and the nearby rain gauge measured 3·5 mm of rainfall. What was the evaporation recorded for the day if the diameter of the pan is 120 cm?   8

4. (a) Define infiltration capacity and discuss the factors affecting infiltration capacity.   6

   (b) The mass curve of an isolated storm in a 500 ha watershed is as follows :

Time from start (h)	0	2	4	6	8
Cumulative rainfall (cm)	0	0·8	2·6	2·8	4·1

10	12	14	16	18
7·3	10·8	11·8	12·4	12·6

If the direct runoff produced by the storm is measured at the outlet of the watershed as 0·340 Mm^3, estimate the ϕ-index of the storm and duration of rainfall excess.   8

5. (a) Explain the salient features of a current meter. Describe briefly the procedure of using a current meter for measuring velocity in a stream. 6

(b) The stream discharges for various stages at a particular section were observed to be as follows. Obtain an equation for the stage-discharge relationship and determine the discharge for stages of 4·9 m and 12 m. Value of $a = 0·9$ m for the gauge reading corresponding to zero discharge : 8

Stage (m)	: 1·81 2·0 2·3 2·9 3·7
Discharge (m³/s)	: 1·0 1·5 2·55 5·6 11·7

4·5 5·4 6·1 7·7 8·1

20·2 32·5 44·5 80·0 90·0

6. (a) Define base flow and describe with the help of a neat sketch, any three methods of separation of base flow from the hydrograph. 6

(b) Derive a 2-h unit hydrograph by S-curve method for the catchment having ordinates of one-hour unit hydrograph of a basin at one-hour intervals as 5, 8, 5, 3 and 1 m³/s. 8

7. (a) What is meant by 75% dependable yield of a catchment? Explain the procedure for calculating 75% dependable yield of a basin at flow gauging station. 6

(b) Flood frequency computations for the river Chambal at Gandhisagar dam, by using Gumbel's method, yielded the following results. Estimate the flood magnitudes in this river with a return period of 500 years : 8

Return period T (years)	50	100
Peak flood (m³/s)	40809	46300

8. (a) Develop the equation relating the steady-state discharge from a well in an unconfined aquifer and depths of water table at two known positions from the well. 6

(b) A tube well taps an artesian aquifer. Find its yield in litres per hour for a drawdown of 3 m when the diameter of the well is 20 cm and the thickness of the aquifer is 30 m. Assume the coefficient of permeability to be 35 m/day. If the diameter of the well is doubled, find the percentage increase in the yield, the other conditions remaining the same. Assume the radius of influence as 300 m in both sides. 8

9. Write short notes on any *three* of the following : 14

   (a) Orographic precipitation

   (b) Depth area duration curve

   (c) Unit hydrograph

   (d) Well losses

   (e) Synder's method for determination of synthetic hydrograph

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