

Fifth Semester B.E. Degree Examination, Dec.09/Jan.10

Hydrology and Water Resources Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain with a neat sketch, Horton's qualitative representative of hydrologic cycle. (08 Marks)
- b. Explain how the double mass curve method is used to test consistency of rainfall record. (06 Marks)
- c. A catchment has six raingauge stations. In a year the annual rainfall recorded by the gauges are as follows:

Station	1	2	3	4	5	6
Rainfall (mm)	826	1029	1803	1103	988	1367

For a 10% error in the estimation of the mean rainfall, calculate the optimum number of stations in the catchment. (06 Marks)

- 2 a. With a neat sketch, explain how evaporation can be measured using IS class A pan. (08 Marks)
- b. Explain the factors affecting infiltration capacity. (06 Marks)
- c. A storm with 10.00 cm precipitation produced a direct runoff of 5.8 cm. Given the time distribution of the storm as below. Estimate the ϕ -index of the storm.

Time from start (h)	1	2	3	4	5	6	7	8
Incremental rainfall In each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1.0	0.5

(06 Marks)

- 3 a. What are the components of hydrograph? Explain how base flow is separated from a simple storage hydrograph. (06 Marks)
- b. Write a note on water budget equation. List the factors affecting runoff. (06 Marks)
- c. Given below are the monthly rainfall P and the corresponding runoff R values covering a period of 18 months for a catchment. Develop a correlation equation between R and P.

Month	1	2	3	4	5	6	7	8	9
P	5	35	40	30	15	10	5	31	36
R	0.5	10	138	8.2	3.1	3.2	0.1	12	16
Month	10	11	12	13	14	15	16	17	18
P	30	10	8	2	22	30	25	8	6
R	8	2.3	1.6	0.0	6.5	9.4	7.6	1.5	0.5

(08 Marks)

- 4 a. Derive an expression for discharge for steady radial flow to well in an unconfined aquifer. (08 Marks)
- b. Briefly explain : Specific retention, transmissibility, specific yield, porosity, permeability and storage co-efficient. (08 Marks)
- c. In an artesian aquifer of 8 mt thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 mt and 50 mt distances from the centre of the well are 3 mt and 0.05 mt respectively. Compute the transmissivity and the hydraulic conductivity of the aquifer. (04 Marks)

PART – B

- 5 a. Explain area-velocity method for measuring the discharge in stream. (08 Marks)
 b. Briefly explain stage-discharge relation. (04 Marks)
 c. In order to compute the flood discharge in a stream by the slope-area method the following data are obtained :

	u/s section	Middle section	d/s section
Area m ²	108.60	103.10	99.80
Wetted perimeter (m)	65.3	60.70	59.4
Gauge reading (m)	316.8	–	316.55

Determine the flood discharge assuming Manning's $n = 0.029$ and length between u/s and d/s sections as 250.00 mt. (08 Marks)

- 6 a. Explain various measures adopted for reservoir sedimentation control. (08 Marks)
 b. Write a note on factors affecting erosion. (06 Marks)
 c. How the sediment yield is determined using sample recorder? (06 Marks)
- 7 a. Explain importance of water resources projects in India. (05 Marks)
 b. Explain any five river basins of India and their water potential. (10 Marks)
 c. Briefly explain water resources development in Karnataka. (05 Marks)
- 8 a. What are the advantages of rain water harvesting? (04 Marks)
 b. Explain any two methods of artificial recharge of ground water. (08 Marks)
 c. Explain any two methods of urban rainwater harvesting. (08 Marks)
