

NTK/KW/15-7410

**Fifth Semester B. E. (Civil Engg.) (CBS)
Examination**

HYDROLOGY AND WATER RESOURCES

Time : Three Hours]

[Max. Marks : 80

- N. B. :** (1) All questions carry marks as indicated.
(2) Answer **total Six** questions as per the choices given from **Twelve** questions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.
(5) Use of Non-programmable electronic calculator is permitted.

1. (a) *Explain briefly the importance of temperature, humidity and wind in hydrological study.* 7

(b) Define the following terms :---

- (i) Intensity of rainfall.
- (ii) Mass curve.
- (iii) Hyetograph.
- (iv) Raingauge (Recording)

(v) Non-recording raingauge

(vi) Artificial rain.

6

OR

2. (a) Explain briefly orographic precipitation and convective precipitation. 5

(b) Calculate the optimum number of rain gauges for a drainage basin so as to limit the percentage error within 8%. At present the drainage basin is provided with 5 raingagucs. The average rainfall in cm at these stations is : 95, 85, 70, 55 and 40. Also determine the standard error of estimation of average rainfall in the existing set of raingauges. 8

3. (a) Draw a typical infiltration curve and indicate on it the various components. If infiltration capacity of a catchment is represented by $f = 0.5 + 1.2e^{-0.5x}$ determine the values of various components. 6

(b) A 6 hour storm produced rainfall intensities of 7, 18, 25, 12, 10 and 4 mm per hour in successive one hour interval over a basin of 600 km². The resulting runoff is observed to be 2650 hecter-meters. Determine ϕ -index for the basin. 7

OR

4.. (a) If 7.35 litres of water is removed from an evaporation pan of diameter 1.25m and

simultaneously the rainfall recorded is 9.2 mm, determine the evaporation in mm. 5

(b) Observations recorded for a reservoir during a period of one day are as follows :

- (i) Catchment area = 25 km²
- (ii) Waterspread = 0.7 km²
- (iii) Precipitation during the period = 50 mm
- (iv) Runoff coefficient for basin = 0.6
- (v) Drop in reservoir water level during the period = 10 cm
- (vi) Constant discharge from reservoir = 9 m³/s.

Find the average rate of evaporation during the given period in mm/hr neglecting seepage losses.

8

5. (a) What are the various components of runoff ? Explain in brief. 6

(b) Explain briefly :—

- (i) Area-velocity method for stream flow measurement.
- (ii) Classification of streams. 8

OR

6. (a) How is base flow separated from the storm hydrography ? 5

(b) Ordinates of 6 hr unit hydrograph are as given below :

Time	0	6	12	18	24	30	36	42	48	54	60	66
6 hr UHO	0	25	65	155	125	95	66	55	33	22	11	00

If two storms each of 6 hr duration occur in succession having rainfall excess 2.5 cm and 4.5 cm resp, compute ordinates of resulting hydrograph assuming base flow 50 cumecs. 9

7. (a) What is the probability that a flood of certain magnitude with a return period of 20 years,

(i) May occur in next 12 years ?

(ii) Occurs twice in 10 successive years ? 6

(b) Explain briefly :—

(i) Causes and effects of flood.

(ii) Risk and reliability. 7

OR

8. (a) Peak flow records for a river at a station, where a reservoir is to be constructed for a period of 80

years is as follows :

- (i) The arithmetic mean of peaks = $7820 \text{ m}^3 \text{ sec}$
- (ii) The standard deviation = $2500 \text{ m}^3 \text{ sec}$

Using Gumbel's method, determine the recurrence interval for a flood of $15000 \text{ m}^3 \text{ sec}$. For 80 year sample size, Reduced mean, $\bar{y}_n = 0.5569$ and reduced standard deviation $S_n = 1.1938$. 6

- (b) A culvert is proposed across a stream draining an area of 180 hectares. The catchment has a slope of 0.004 and length of travel of water is 1150m. Estimate 25 years flood if rainfall intensity is given by,

$$I = \frac{1000 T_r^{0.2}}{(t + 20)^{0.7}} \quad \begin{array}{l} I \rightarrow \text{mm/hr} \\ T_r \rightarrow \text{years} \\ t \rightarrow \text{minutes} \end{array}$$

Assume runoff coeff. = 0.35

7

9. (a) Define and discuss :—

- (i) Porosity.
- (ii) Specific retention.
- (iii) Aquifer.
- (iv) Perched water table. 6

- (b) In an confined aquifer 8 m thick, a 10 cm dia. Well

is pumped at 100 lit/min. Steady drawdown observed in two wells located at 10 m and 50 m from the centre of the well are 3m and 0.05 m resp. compute the transmissibility and the hydraulic conductivity of the aquifer. 7

OR

10. (a) The water level in the well was depressed by 3.5 m and it was observed to rise by 1.25 m in 60 minutes, determine.

(i) Yield from a well of 2.5 m dia, under a depression head of 3.0 m

(ii) Diameter of a well to yield 7.5 lit/sec under a depression of 2.2 m. 7

(b) Explain in brief methods of groundwater exploration. 6

11. (a) Explain in brief Groundwater recharge and any two recharging methods. 7

(b) Explain briefly :—

(i) Ground water quality.

(ii) Ground water movement. 7

OR

12. Write short notes on : (Any Four) :—

(i) Inter-basin water transfer.

- (ii) Water resource planning through watershed management.
- (iii) Multipurpose project.
- (iv) Interstate river dispute.
- (v) Selection of recharge sites.

$$3\frac{1}{2} \times 4 = 14$$