

B.E. (Civil Engineering) Fifth Semester (C.B.S.)  
**Hydrology & Water Resources (HWR)**

P. Pages : 2

Time : Three Hours



TKN/KS/16/7410

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data whenever necessary.
  4. Illustrate your answers whenever necessary with the help of neat sketches.
  5. Use of non programmable calculator is permitted.

1. a) Described hydrological cycle. Explain with neat sketch the various process involved in it. **7**  
b) Define precipitation. Explain in brief the different types of precipitation. **6**

**OR**

2. a) The average annual rainfall depth recorded at existing five rain gauge station in a drainage basin are 900, 810, 550, 400 & 320 mm. Determine the optimum no of rain gauge stations in the basin so as to limit the percentage error within 10%. Also determine the additional no of rain gauges required to be install in the existing basin. **7**  
b) Explain with neat sketch cyclonic precipitation. **6**

3. a) For a 120 min. storm, following are the rainfall recorded at 20 min. interval : **6**  
2.5 cm/hr, 2.5 cm/hr, 1.1 cm/hr, 7.5 cm/hr, 12.5cm/hr and 5.0 cm/hr.  
Assuming  $\phi$  index to be 3.2 mm/hr, find out the net runoff, total rainfall and w-index.  
b) What are the various factors affecting infiltration? Discuss the salient features of infiltration capacity curve. **7**

**OR**

4. a) Explain in brief: **6**  
i) ISI standard evaporation pan. ii) Water budget method.  
b) Compute the weekly evaporation from a reservoir from the following data recorded during the week: **7**  
Average inflow into the reservoir = 32.5 m<sup>3</sup>/s.  
Average outflow from the reservoir = 40.2 m<sup>3</sup>/s.  
Rainfall during the week = 73.6 mm.  
Average water spread area = 15.8 km<sup>2</sup>.  
Estimated seepage = 0.25 million m<sup>3</sup> storage at the beginning of the week = 9180 Ha-m  
Storage at the end of the week = 8630 Ha-m.

5. a) Discuss the various factors which affect the runoff from a basin. **6**  
b) The following are the ordinates of 3 hr. Unit hydrograph. Derive the ordinates of a 6 hr. Unit hydrograph and plot the same: **7**

Time (hr)	0	3	6	9	12	15	18	21	24
3 hr. unit hydrograph ordinates (cumec)	0	1.5	4.5	8.6	12	9.4	4.6	2.3	0.8

**OR**

6. a) Explain briefly: 6  
 i) Classification of streams                      ii) Components of runoff.
- b) What is base flow? Describe two methods to separate base flow from total runoff. 7
7. a) Write a note on: 7  
 i) Flood routing                                      ii) Flood forecasting.
- b) A culvert is to be designed for a stream of catchment area 200 Ha. This area has a slope of 1 in 1000 and length of travel for water is 1150 m. Estimate the 25 year flood, if the maximum intensity of rainfall is given by; 7
- $$I = \frac{1000 T_r^{0.2}}{(t + 20)^{0.7}}$$
- Where I is in mm/hr,  $T_r$  is in years and t is in minutes. Assume runoff coefficient of 0.35.
- OR**
8. a) Explain briefly **any two**. 6  
 i) Linear regression.  
 ii) Correlation coefficient.  
 iii) Standard error of estimate.
- b) Compute mean, standard deviation and coefficient of variation for the following 20 year annual peak flow in a river in  $m^3/sec$  :- 8  
 190,155,298,136,137,131,140,124,185,104,91,154,109,269,164,270,142,72,130, and 115.
9. a) Define specific yield and specific retention and show their sum is equal to porosity. 6
- b) Calculate the average yield of a well of 3m diameter from the recuperation test wherein the water level is depressed to the extent of 2.5 m and recuperation rate is 1.5 m in 60 minutes. Average depression head is 3 m. 8
- OR**
10. a) In confine aquifer 10 m thick, 12 cm diameter well is pump at constant rate of 80 lpm. The steady state drawdown observed in two wells located at 15 m & 60 m distance from the centre of well have drawdown of 2.5 m & 0.05 m respectively. Compute the transmissibility & hydraulic conductivity of the aquifer. 8
- b) Difference between 6  
 i) Aquifer & aquitard  
 ii) Pumping test & recuperation test.
11. a) Explain in details the methods of groundwater recharge. 7
- b) What is rainwater harvesting? Explain the various types of rainwater harvesting. Methods. 6
- OR**
12. Write a short notes of following **any three**. 13  
 i) Interstate River dispute.  
 ii) Multipurpose reservoir project  
 iii) Water shed management.  
 iv) Resource planning in project.

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