

III B. Tech II Semester Regular Examinations, April/May - 2019
WATER RESOURCE ENGINEERING-I
(Civil Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) What do you mean by transmissivity of an aquifer? [2M]
- b) What do you mean by flood routing? [2M]
- c) Write any four factors which affect runoff. [2M]
- d) What is flow mass curve and flow duration curve? [3M]
- e) What is the possible source of error in the measurement of rainfall? [3M]
- f) Define unit hydrograph. [2M]

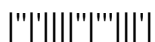
PART -B

2. a) Describe worlds Water Resources and Water Resources of India. [8M]
- b) Explain various forms of precipitation. [6M]
3. a) Describe various components of runoff. [7M]
- b) Differentiate between [7M]
 - (i) Potential evapotranspiration and actual evapotranspiration.
 - (ii) Actual infiltration rate and infiltration capacity.
4. a) A watershed of 3130 sq. km was subjected to a storm of 4 hr duration from which the following are recorded: [7M]

Time (h)	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21
Discharge (cumecs)	20	16	175	270	230	200	170	150	130	115	100	90	80	70	60

Obtain an UH for the watershed.

- b) Describe how unit hydrograph can be used to predict the runoff from a storm? What are the uses of unit hydrograph? [7M]
5. a) Explain how the reservoir characteristic curves are prepared? [8M]
- b) Explain the Muskingum and puls methods of Routing. [6M]
6. a) Explain various rock properties effecting ground water. [8M]
- b) Distinguish between [6M]
 - (i) Aquifer and Aquifuge
 - (ii) Aquiclude and Aquitard
 - (iii) Groundwater and perched groundwater.
7. a) Define instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration? [8M]
- b) Explain the concept of Clark's IUH. [6M]



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PART -A

1. a) How you distinguish confined aquifer from Unconfined aquifer? [2M]
- b) Discuss Darcy's law. [2M]
- c) Write any four factors affecting Evapotranspiration. [2M]
- d) Describe the principle of working of a float type rain gauge with a neat sketch. [3M]
- e) What is a depletion curve? [3M]
- f) What are the limitations of hydrograph? [2M]

PART -B

2. a) Discuss with a neat sketch various methods used to compute average rainfall over a basin. [8M]
- b) Discuss the following [6M]
 (i) Depth-Area-Duration curves (ii) Probable Maximum Precipitation (PMP)
3. a) The rates of rainfall for successive 30 min period of 210 min storm are: 3.5, 4.0, 12.0, 8.5, 4.5, 4.5 and 3.0 cm/hr. Assuming the ϕ -index of 3.5 cm/hr, find out the net rainfall in cm, the total rainfall and the value of W-index. [8M]
- b) Describe any two methods of separating the base flow from the total runoff. [6M]
4. a) The ordinates of a 4-h UH are given below. If there is a 4 cm effective rainfall occurring uniformly for 4-h, calculate the DRH resulting from the storm. [8M]

Time (h)	0	2	4	6	8	10	12	14	16	18	20	22	24
4 h UH ordinate (cumecs)	0	9	24	50	66	72	65	53	28	20	11	6	0

- b) Sketch a typical hydrograph resulting from an isolated storm and explain various features of it. [6M]
5. a) From the historical data of annual flood peaks of a catchment the mean and standard deviation are estimated at 20000 m³/sec and 10000 m³/sec. An existing structure on this catchment has been designed for 40000 m³/sec. What could be its return period? (Assume standard deviation and mean of the reduced extremes which depend on the sample size and taken from Gumbel's table are 1.06 and 0.52). [8M]
- b) Define flood routing. What are the uses of flood routing? [6M]
6. a) List out the assumption made in the analysis of steady radial flow into well. [7M]
- b) Distinguish between [7M]
 (i) Transmissivity and storativity (ii) Darcy velocity and actual velocity
7. a) What are the advantages of instantaneous unit hydrograph over a unit hydrograph of finite duration? Explain. [7M]
- b) Explain the Nash's conceptual model for IUH and derive the equation for IUH. [7M]



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PART -A

1. a) What do you mean by rainfall hyetograph? [2M]
- b) With a neat diagram describe coefficient of permeability. [2M]
- c) Write any four factors which affect infiltration. [2M]
- d) Write the assumption of Unit Hydrograph. [3M]
- e) Describe the principle of working of a tipping bucket type recording rain gauge with a neat sketch. [3M]
- f) What do you mean by base flow? [2M]

PART -B

2. a) What are the precautions to be taken in selecting a site for the location of rain gauge? [6M]
- b) List out various practical applications of hydrology. [8M]
3. a) Define ϕ -index and W-index and bring out the difference between them. How is ϕ -index determined from the rainfall hyetograph? [7M]
- b) Discuss the various factors affecting evapotranspiration. [7M]
4. a) The ordinates of a 3-hr unit hydrograph are given below. Derive the flood hydrograph due to a 3-hr storm, producing a rainfall excess (net rain) of 4 cm. The base flow is estimated to be 3 cumec and may be assumed constant. [8M]

Time (hr)	0	3	6	9	12	15	18	21	24	27
3-hr UH ordinates (cumec)	0	1.5	4.5	8.6	12.0	9.4	4.6	2.3	0.8	0

- b) Explain 'synthetic unit hydrograph'. [6M]
5. a) Describe the method of estimating a T_r – year flood using Gumbel's distribution. [8M]
- b) Discuss various flood control methods and management. [6M]
6. a) Derive an expression for the steady state discharge of well fully penetrating into a confined aquifer. [8M]
- b) List out the assumptions made in the analysis of steady radial flow into well. [6M]
7. a) What are the advantages of instantaneous unit hydrograph over a unit hydrograph of finite duration? [8M]
- b) Explain the concept of Clark's IUH. [6M]



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PART -A

1. a) What do you mean by artesian well? [2M]
- b) Write any four factors which affect Evaporation. [2M]
- c) What are various causes and effects of floods? [2M]
- d) Write any one method which describes separation of base flow from flood hydrograph. [3M]
- e) Mentioned various application of Unit hydrograph theory. [3M]
- f) What do you mean by flow mass curve? [2M]

PART -B

2. a) Describe the hydrological cycle with a neat sketch. [7M]
- b) Describe the principle of working of a float type recording rain gauge with a neat sketch. Discuss its advantages and disadvantages. [7M]
3. a) Describe various factors affecting runoff. [6M]
- b) Define ϕ -index and W-index and bring out the difference between them. How is ϕ -index determined from the rainfall hyetograph? [8M]
4. a) Define an 'S-curve hydrograph' giving a neat sketch, and state its use. [7M]
- b) The ordinates of a 12-hour unit hydrograph are given below. Compute 6-hour unit hydrograph ordinates using S-curve technique. [7M]
5. a) An aquifer has an average thickness of 50 m and an aerial extent of 150 ha. Estimate the available ground water storage if the aquifer is unconfined and fluctuation in GWT is observed as 10 m. [8M]
- b) State Darcy's law and its limitations. [6M]
6. a) A tube well penetrates fully an 8 m thick water bearing stratum (confined) of medium sand having coefficient of permeability of 0.004 m/sec. The well radius is 15 cm and is to be worked under a drawdown of 3 m at the well face. Calculate the discharge from the well. What will be the percentage increase in the discharge if the radius of the well is doubled? Take radius of zero drawdown equal to 400 m in each. [8M]
- b) Differentiate between [6M]
 - (i) Hydraulic routing and hydrological routing
 - (ii) Prism storage and wedge storage
7. a) Define instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration? [7M]
- b) Explain the Nash's conceptual model for IUH and derive the equation for IUH. [7M]

