

Code No: RT32014

R13**SET - 1****III B. Tech II Semester Regular Examinations, April- 2016****WATER RESOURCES ENGINEERING-I**

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answering the question in **Part-A** is compulsory3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Explain hydrologic cycle with a neat sketch. [3M]
- b) Discuss Horton's infiltration equation. [4M]
- c) Describe briefly the various components of runoff. [4M]
- d) Define flood routing. What are the uses of flood routing? [3M]
- e) Define transmissivity, storage coefficient and hydraulic conductivity of an aquifer. [4M]
- f) Write a short note on rainfall-runoff modeling. [4M]

PART -B

- 2 a) Explain various types of precipitation. [4M]
- b) Describe double mass curve method to check the consistency of rainfall data [6M]
- c) The annual rainfalls in cm at a station for a period of 21 years from 1960 to 1980 are 97, 125, 103, 81, 101, 119, 103, 79, 102, 118, 98, 83, 105, 123, 100, 86, 99, 114, 91, 83 and 106. Determine the 75% dependable rainfall from frequency analysis. [6M]
- 3 a) Explain any three methods of estimating the evapotranspiration. [8M]
- b) Explain the double ring infiltrometer with adjustable depth of flooding with the help of a neat sketch. [8M]
- 4 a) Explain the various factors affecting the runoff. [6M]
- b) Given below are the ordinates of a 4-hour unit hydrograph of a basin in m^3/s at one hour intervals. [10M]
4, 25, 44, 60, 70, 61, 52, 45, 38, 32, 27, 22, 18, 14, 11, 8, 6, 4, 2 and 1.
Derive 2-hour unit hydrograph.
- 5 a) Explain the Gumbel's method of estimation of T-year flood. [8M]
- b) Describe the various steps involved in the Pul's method of reservoir routing. [8M]
- 6 a) Derive an expression for the steady state discharge of a well fully penetrating into a confined aquifer. List out the assumptions made. [8M]
- b) During the recuperation test conducted on an open well in a region, the water level in the well was depressed by 3 m and it was observed to rise by 1.75 m in 75 minutes. What is the specific yield from wells in that region? What could be the yield from a well of 5 m diameter under a depression head of 2.5 m? What should be the diameter of the well to give a yield of 12 lit/s under a depression head of 2 m? [8M]
- 7 a) Define Instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration? [8M]
- b) Explain the concept of Clark's Instantaneous Unit Hydrograph. [8M]

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SET - 2
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Max. Marks: 70

 Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

 2. Answering the question in **Part-A** is compulsory

 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) What are the various forms of precipitation? [3M]
- b) Define ϕ -index and W-index and bring out the difference between them. [4M]
- c) Describe any two methods of separating base flow from total runoff. [4M]
- d) Differentiate between channel routing and reservoir routing. [3M]
- e) Explain briefly various types of aquifers. [4M]
- f) Write short note on rainfall-runoff modeling. [4M]

PART -B

- 2 a) Explain various methods of determination of average rainfall over a basin [6M]
- b) Explain Intensity-Duration-Frequency curves. [4M]
- c) The average annual rainfalls of 5 rain gauges in a basin are 89,54,45,41 and 55 cm. If the error in the estimation of basin mean rainfall should not exceed 10%, how many additional gauges should be installed in the basin? [6M]
- 3 a) Describe how the evaporation is measured using atmometers. Also explain various methods of reducing the evaporation from a water body. [8M]
- b) A seven hour storm produced the following rainfall intensities in mm/h at half an hour intervals over a basin of area 1830 km² are 4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1. If the corresponding observed runoff is 36.6 million m³, estimate the ϕ -index. [8M]

- 4 a) Explain any two methods of estimating runoff [6M]
- b) The following are the ordinates of a 12-hour unit hydrograph. [10M]

Time (hr)	0	12	24	36	48	60	72	84
Flow (m ³ /s)	0	1600	2900	2600	1400	700	150	0

If successive 12 hour rainfall excesses are 1.5 cm, 3.0 cm and 0.75 cm for the catchment, obtain the ordinates of a resulting storm hydrograph if constant base flow of 20 m³/s is assumed.

- 5 a) What do you understand by the frequency factor? How is it determined for Gumbel's distribution? [8M]
- b) Explain the method of determining the Muskingum parameters K and x of a reach from a pair of observed inflow and outflow hydrographs. [8M]

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R13**SET - 2**

- 6 a) Derive the expression for the steady state discharge of well fully penetrating into a unconfined aquifer. [8M]
b) Explain the terms (i) cone of depression (ii) specific yield [8M]
(iii) flowing well (iv) Darcy's velocity.
- 7 a) Define Instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration? [8M]
b) Explain the concepts of Nash model of Instantaneous Unit Hydrograph. [8M]

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SET - 3
III B. Tech II Semester Regular Examinations, April - 2016
WATER RESOURCES ENGINEERING-I

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

 Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

 2. Answering the question in **Part-A** is compulsory

 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Explain various methods for finding the missing data of rainfall. [3M]
- b) Define pan coefficient. Discuss the relative merits and demerits of sunken, floating and land pans. [4M]
- c) Describe how unit hydrograph can be used to predict the runoff from storms. [4M]
- d) What is a design storm? What is Probable Maximum Flood? [3M]
- e) Distinguish between aquifer, aquitard and aquiclude. [4M]
- f) Write short note on rainfall-runoff modeling. [4M]

PART -B

- 2 a) Explain the Depth-Area-Duration curves [4M]
- b) What do you understand by dependable rainfall? How do you analyse the available data to obtain 75% dependable annual rainfall? [6M]
- c) Estimate the total volume of rainfall received in m^3 in a basin consisting of 5 rain gauges. The polygon area of each station in hectare are 518,777, 906, 1495 and 748. The corresponding rainfalls in mm at each rain gauge station in the same order are 267, 198, 142, 114 and 81. [6M]
- 3 a) Discuss various factors affecting the evapotranspiration. [6M]
- b) Define ϕ -index and W-index. [4M]
- c) A storm with uniform intensity of 1.6 cm/hour for a period of 8 hours occurring over a basin of area 650 km^2 produced a runoff estimated to be 57.2 million m^3 . Find the average infiltration rate during the storm. [6M]
- 4 a) List out various physiographic factors which affect runoff. Discuss their influence on the volume of runoff and on the time distribution of runoff. [8M]
- b) Given below are the ordinates of a unit hydrograph for a storm of 4-hour duration. Find ordinates of flood hydrograph when the maximum flood observed was $400 \text{ m}^3/\text{s}$ and base flow was $250 \text{ m}^3/\text{s}$. [8M]

Time (hours)	0	4	8	12	16	20	24
Flow (m^3/s)	0	1500	1200	600	220	80	0

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R13**SET - 3**

- 5 a) Describe the method of estimating a T-year flood using Log-Pearson type-III distribution. [8M]
b) Derive the Muskingum routing equation and the expressions for the routing coefficients C_0 , C_1 and C_2 . [8M]
- 6 a) Explain how yield of an open well can be determined using recuperation test. [8M]
b) In a water table aquifer of 50 m thickness, a 20 cm diameter well is pumped at a uniform rate of $0.05 \text{ m}^3/\text{s}$. If the steady state drawdown measured in the observation wells located at 10 m and 100 m distances from the well are 6.5 and 0.25 m respectively, determine the hydraulic conductivity of the aquifer. [8M]
- 7 a) Explain the concepts of Nash model of Instantaneous Unit Hydrograph. [8M]
b) What is a hydrological model? Explain any one of them. [8M]

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R13**SET - 4****III B. Tech II Semester Regular Examinations, April - 2016**
WATER RESOURCES ENGINEERING-I

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Time: 3 hours

Max. Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) How to estimate the optimum number of rain gauges required in a basin? [3M]
- b) Discuss the factors affecting evaporation. [4M]
- c) What is a S-hydrograph? How it is constructed? What are its uses? [4M]
- d) Distinguish between return period and exceedence of probability. [3M]
- e) Write short note on occurrence of ground water. [4M]
- f) Write short non on rainfall-runoff modeling. [4M]

PART -B

- 2 a) Describe any three types of rain gauges for measurement of rainfall with neat sketches. [4M]
- b) Describe the procedure involved in the analysis for developing intensity-duration-frequency relationships. Sketch a typical set of these curves. [8M]
- c) Rain gauge station X did not function for a part of a month during which a storm occurred. The storm produced rainfalls of 84, 70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfalls at the stations X, A, B and C are respectively 770, 882, 736 and 944 mm. Estimate the missing storm rainfall at station X. [4M]
- 3 a) Explain how the evapotranspiration can be estimated using the Blaney-Criddle and Thornthwaite equations. [8M]
- b) What are the factors affecting infiltration? Explain how infiltration can be measured using the double ring infiltrometer. [8M]
- 4 a) What is stream gauging? How it is useful? Explain the area-velocity method of stream gauging. [8M]
- b) Given below are the observed flows (cumecs) from a storm of 6 hour duration on a stream with a drainage area of 316 km². Assume a constant base flow of 17 cumecs. Derive a 6-hour duration unit hydrograph. [8M]

Time (hr)	0	12	24	36	48	60	72
Flow	17	254.5	150	87.7	53.8	31.1	17

- 5 a) Describe the method of estimating a T-year flood using Gumbel's distribution. [8M]
- b) Describe the Pul's method of reservoir routing. [8M]

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R13**SET - 4**

- 6 a) Derive the expression for yield of a open well by recuperation test. [8M]
- b) A 20 cm well penetrates fully a confined aquifer of thickness 30 m. When the well is pumped at rate of 250 litre/minute the steady state drawdown in the two observation wells located at 10 m and 100 m distance from the pumping well are found to be 3.5 and 0.05 m respectively. Calculate the permeability and the transmissivity of the aquifer. [8M]
- 7 a) Define Instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration? [8M]
- b) Explain the concept of Clark's Instantaneous Unit Hydrograph. [8M]
