

(Civil Department)

(Water Resources and Hydroinformatics)

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017

07-CE-6407 SURFACE WATER HYDROLOGY

Time:3 hours

Max. marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

(Students are permitted to bring Graph sheets and Certified data tables.)

Module 1

- 1a** Discuss briefly the various stream patterns. **4**

Answer b or c

- 1b** What is DAD curve? Write the procedure for the construction of DAD curve for a basin **5**

- 1c** Explain a procedure for supplementing the missing rainfall data. **5**

Module 2

- 2a** Briefly describe the factors affecting evapotranspiration process. **4**

Answer b or c

- 2b** An isolated 3-hr storm occurred over a basin in the following fashion. **5**

% of catchment area	Φ index(cm/hr)	Rainfall (cm)		
		1 st hour	2 nd hour	3 rd hour
20	1.00	0.8	2.3	1.5
30	0.75	0.7	2.1	1.0
50	0.50	1.0	2.5	0.8

Estimate the runoff from the catchment due to the storm **5**

- 2c** Explain the double ring infiltrometer test to determine the infiltration rate and explain how the Horton's constants can be computed using these observed data.

Module 3

- 3a** Define Unit Hydrograph. What are the assumptions underlying the Unit Hydrograph theory. How do they limit the applicability of unit hydrograph? **4**

Answer b or c

- 3b** Describe two methods of deriving Unit Hydrographs from complex storms. **5**

- 3c** The ordinates of a 6 hr Unit Hydrograph are given **5**

Time (h)	0	3	6	9	12	18	24	30	36	42	48	54	60	66
Ordinate of 6h UH (m^3/s)	0	150	250	450	600	800	700	600	450	320	200	100	50	0

A storm had three successive 6-h intervals of rainfall magnitude of 3.0, 5.0, and 4.0 cm, respectively. Assuming a ϕ index of 0.20 cm/h and a base flow of $30 \text{ m}^3/\text{sec}$, determine and plot the resulting hydrograph of flow.

Module 4

- 4a** What is an IUH? What are its characteristics? 4

Answer b or c

- 4b** Characteristics of two catchments M and N measured from a map are given below. 5

For catchment M: $L_{ca}=76 \text{ km}$, $L=148 \text{ km}$, and $A=2718 \text{ km}^2$. For catchment B: $L_{ca}=52 \text{ km}$,

$L=106 \text{ km}$, and $A=1400 \text{ km}^2$. For the 6h Unit Hydrograph in catchment M, the peak discharge obtained is at $200 \text{ m}^3/\text{s}$ and occurs at 37 h from the start of the rainfall excess. Assuming the catchments M and N are meteorologically similar, determine the elements of the 6h synthetic Unit Hydrograph for the catchment N by using Snyder's method

- 4c** What is flood? Describe any four methods of estimation of flood 5

Module 5

- 5a** Explain the stream flow measurement using area velocity method 5

Answer b or c

- 5b** Route the following flood hydrograph through a river reach for which Muskingum coefficient $k=8 \text{ h}$ and $x=0.25$

Time (h)	0	4	8	12	16	20	22	24	28
Inflow m^3/s	8	16	30	30	25	20	40	15	10

- 5c** What is meant by flood routing? What are the uses of flood routing? Differentiate Reservoir routing and channel routing 7

Module 6

- 6a** Differentiate between Flow mass curve and Flow duration curve. 5

Answer b or c

- 6b** The following gives the observed annual flood values in a river. Estimate the flood peaks with return periods of 50 years using Gumbel's extreme value distribution and 100 years by using Log-Pearson Type III distribution 7

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Flood (m^3/s)	3210	4000	1250	3300	2480	1780	1860	4130	3110	2320	2480	3405

- 6c** Write a note on (a) Time series (b) Return period (c) I-D-F Curve. 7