Ref No. –Ex/PG/CE/T/116B/6/2017

MASTER OF CIVIL ENGINEERING EXAMINATION, 2017
1st Semester

SUBJECT: **ADVANCED HYDROLOGY & GROUND WATER**

Time: ~~Two hours~~/Three hours/~~Four hours/ Six hours~~ Full Marks: 100

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks :40)	Marks
1.	Define Recurrence interval and Frequency as applied to annual floods or rainfall.	5
	The observed annual flood peaks of a storm for a period of 40 years are given below : 395, 619, 766, 422, 282, 990, 705, 528, 520, 436, 697, 624, 496, 589, 598, 359, 686, 726, 527 310. 408, 721. 814, 459, 440, 632, 343, 634, 464, 373, 289, 371, 522, 342, 446, 366, 699, 560 450. 610	
	Assuming that Gumbel's distribution fits the data, estimate 100 year and 200 year flood. Take $y_n = 0.5642$, $\sigma_n = 1.14132$	15
2.	Define flood routing. What are the uses of flood routing ? Differentiate between Channel routing and Reservoir routing.	2+2+2 = 6
	The inflow and outflow hydrograph of a natural stream are as follows :	
	Time (hrs) 0 6 12 18 24 30 36 42 48 54 60	
(c)	Inflow (m^3/s) 5 18 48 30 20 12 8 5 3 3 3	
	Outflow (m^3/s) 5 4 10 27 36 33 27 21 15 11 7	
	Estimate the value of K and x in Muskingum equation .	14

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MASTER OF CIVIL ENGINEERING EXAMINATION 2017
(1st Semester)

ADVANCED HYDROLOGY & GROUNDWATER

Time: Three Hours

Full Marks 100
(Part I: 40 Marks
Part II: 60 Marks)

Use a separate Answer-Script for each part

Question No.		Part II (60 Marks)	Marks
		*Answer question **1 as compulsory**, and any **TWO** questions from 2, 3, 4, and 5 in this Part*	
1		Make a list of different forms of atmospheric water. Explain the measurement methods of them.	10
2	(a)	What are hydrologic data?	3
	(b)	What is hydrologic investigation?	3
	(c)	Where the hydrologic investigation is required?	4
	(d)	Why the importance of hydrologic investigation?	4
	(e)	What is the sequence of hydrologic measurement? Explain each step.	4+7=11
3	(a)	How many types of rain gauges are used for precipitation measurements? What are those?	1+2=3
	(b)	In an area the precipitation is occurring continuously for three days. What type of raingauge may be used for estimation of precipitation intensity per hour basis? Explain the reason.	2
	(c)	What are the important considerations for installation of rain gauge?	3
	(d)	Note down the recommendations for rain gauge network as per World Meteorological Organisation (WMO) and Indian Standards (IS 4987).	3+3=6
	(e)	What are the methods for calculating mean precipitation over an area? Explain the methods.	1+5=6
	(f)	What is missing data in precipitation measurement? How the missing data can be estimated?	1+4=5
4	(a)	How the stream flow can be measured? Define rating curve. What it indicates?	2+2+2=6
	(b)	Estimate the discharge of a particular location of a stream for the data tabulated below.	11

Gauge Distance from Initial Point at Bank of the Stream (M)	Depth, d (m)	Mean Velocity v (m/s)	Gauge Distance from Initial Point at Bank of the Stream (M)	Depth, d (m)	Mean Velocity v (m/s)
0	0.0	0.00	180	5.7	2.25
10	3.1	0.37	190	5.1	2.05
30	4.4	0.87	210	6.0	1.44
50	4.6	1.09	225	6.5	1.32
70	5.7	1.34	240	7.0	1.20
90	4.5	1.36	255	7.2	1.04
110	4.4	1.39	270	6.2	0.86
130	5.4	1.42	285	5.5	0.45
150	6.1	2.03	300	3.6	0.26
160	5.8	2.22	315	0.0	0.00

	(c)	Draw a rating curve, on an appropriate graph sheet, for the total discharge estimated above; assuming initial gauge reading as 4.5m, and the increment of water level is 0.2m/hr for 12 hours.	8
5	(a)	The values of annual precipitation in a particular area from 1960 to 2009 have been given in the following table. Use this data to plot the time series curve and the frequency histogram. Also estimate the probability of the annual precipitation in any year to be occurred less than 30mm; greater than 40mm and in between them.	20

Year	0	1	2	3	4	5	6	7	8	9
1960	35.2	35.3	37.4	35.6	36.2	37.4	33.2	36.2	32.9	35.3
1970	38.3	35.2	37.4	36.7	37.8	36.9	38.2	36.8	35.2	33.0
1980	37.5	35.7	36.5	32.5	28.9	33.6	35.2	38.3	39.0	38.6
1990	32.4	41.2	42.3	40.5	40.6	40.1	41.2	42.5	43.2	42.3
2000	30.1	43.7	44.1	43.9	43.2	39.0	41.8	40.0	40.9	40.1

	(b)	Define any two: (i) Relative frequency, (ii) Conditional probability, (iii) Cumulative probability	5