Ref. No. Ex/PG/CE/T/116B/2018

MASTER OF CIVIL ENGINEERING EXAMINATION 2018
(First Year; First Semester)

ADVANCED HYDROLOGY & GROUNDWATER

Time: Three Hours

Full Marks 100
[Part I: 60 Marks
Part II: 40 Marks]

Use a separate Answer-Script for each part

Question No.		Part I (60 Marks)	Marks
		*Answer any **THREE** questions in this Part*	
1	(a)	Draw a block diagram to represent the Global Hydrological Cycle.	**12**
	(b)	What is importance of hydrologic measurements in any water resource project? Explain briefly with example.	**8**
2	(a)	What are hydrologic data?	**3**
	(b)	What is hydrologic investigation?	**3**
	(c)	Where the hydrologic investigation is required?	**4**
	(d)	What is the sequence of hydrologic measurement? Explain each step.	**4+6=10**
3	(a)	What do you mean by atmospheric water, surface water and groundwater? Make a list of them.	**8**
	(b)	Write down the measurement procedure of any four hydrologic parameters.	**12**
4	(a)	Define rating curve. Draw and explain a typical rating curve. What is the utility of the rating curve? What is the probability that the standard normal random variable z will be less than -1 and less than 1?	1+2+3=6
	(b)	What is P(-1< z <1)? The coefficients of *Abramowitz and Stegun's* (1965) polynomial are as follows: First order coefficient = 0.196854; Second order coefficient = 0.115194 Third order coefficient = 0.000344; Fourth order coefficient = 0.019527	3
	(c)	Write short note on 'Probability Distribution Function' and 'Probability Density Function'.	**3**
	(d)	Define: (i) Relative frequency, (ii) Objective and subjective probabilities, (iii) Conditional probability, (iv) Cumulative probability	**8**
5		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

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M.E. CIVIL ENGINEERING EXAMINATION,I ST YEAR 2018
First year, 1ST Semester

ADVANCED HYDROLOGY AND GROUNDWATER

Full Marks ~~30~~/100

Time: ~~Two hours~~/Three hours/~~Four hours/ Six hours~~

Use a separate Answer-Script for each part

No. of Questions	Part II(Marks:40)	Marl Qu
	Answer any three (3) the questions .Assume relevant data if necessary 1 mark for neatness and to the point answer.	
Q1.		
(i)	What do you understand by compressibility of aquifer? How it is developed?	2
(ii)	Derive the necessary equation for determining storage coefficient(S), for the confined aquifer of thickness B, for accomplishing adjustment of aquifer stress which experiences movement of huge traffic load. State also hypothesis of deriving the expression.	5
(iii)	Given the following 2-hr unit hydrograph ordinate. Using the method of S-hydrograph construct and plot a 3-hr hydrograph. Time,hr 0 1 2 3 4 5 6 Q, m3/sec 0 35 7.15 5.75 3.5 1.45 0	6 Q
Q.2.		
(i)	Prove that , $\frac{d^2h^2}{dx^2} + \frac{d^2h^2}{dy^2} = -2R/K$, for unconfined flow with recharge ' R ' . Use Dupits approach.	5
(ii)	Discuss the different aspects of ground water pollution with the help of necessary sketches	4
(iii)	Explain the importance and significance of rainwater harvesting. Describe briefly any one method of groundwater recharge.	4
Q3		
(i).	The 6 hr. UH of a basin is triangular in shape with a peak value of 100 m^3/sec. occurring at 24 h from the start. The base is 72 h. Calculate the flood hydrograph due to a storm of rainfall excess of 20 mm during the first 6 hr and 40 mm during the second 6 hr interval. The base flow is 25 m^3/sec.	4

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First year, 1ST Semester

ADVANCED HYDROLOGY AND GROUNDWATER

Full Marks ~~30~~/100

Time: ~~Two hours~~/Three hours/~~Four hours/ Six hours~~

Use a separate Answer-Script for each part

Mark	No. of Questions	Part II(Marks:40)	Marks
	(ii)	Item / Catchment A / Catchment N L_{ca} / 76 km / 52 km L / 148 km / 106 km A / 2718 km^2 / 1400 km^2 Characteristics of two catchments A and B measured from a map are given above and below. For the 6 hr UH in catchment A, the peak discharge is at 200 m^3/sec and occurs at 37 hr from the start of the rainfall excess. Assuming the catchments are metrologicallly similar, determine and plot the 6h synthetic UH for the catchment N using Snyder's approach.	09
	Q 4.		
	(i)	Two rivers M and N run parallel to each other and fully penetrate the unconfined aquifer situated on a horizontal impervious base. The rivers are 4.0 km apart and the K_P of the aquifer is 1.5 m/day. The average water surface elevations of the rivers M and N, measured above the horizontal impermeable bed are 12 m and 9.0 m respectively. If the region between the rivers received an annual net infiltration of 20 cm in that year. Estimate	8
	(a)	The location of the GW table divide	
	(b)	The elevation of the water table divide	
	(c)	The average daily GW discharge into rivers M and N from the aquifer between them.	
	(ii)	A well is located in a 25 m confined aquifer of permeability 30m/day and storage coefficient 0.005. If the well is being pumped at the rate rate of 1750 lpm, calculate the drawdown at a distance of 80 m from the well after 25 hr of pumping . Use Theis method.	5