Ref. No. Ex/CE/T/224/2017

BACHELOR OF CIVIL ENGINEERING EXAMINATION 2017

(Second Year, Second Semester)

HYDROLOGY

Time: Three Hours

Full Marks 100
Part-I: 40 Marks Part-II: 60 Marks

Use a separate Answer-Script for each part

No. of questions	Part I (40 Marks)	Marks

*Answer **ANY TWO** questions from this part. Assume suitable values for the parameters if not supplied.*

1 (a) Estimate the discharge of a particular location of a stream for the data tabulated below. — 12

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

(b) Draw a rating curve, on an appropriate graph sheet, for the total discharge estimated in 1(a), assuming initial gauge reading as 4.8m, and the increment of water level is 0.3m/hr for 12 hours. — 8

2 (a) Draw the flowchart for sequence of hydrological measurements. Also explain briefly. — 7+7=14

(b) What is called raingauge network? What is the recommendation of 'World Meteorological Organisation' (WMO) and 'Indian Standard' (IS) regarding raingauge network? — 1+5=6

3 (a) Define and explain rating curve. What it indicates? — 3+2=5

(b) How the surface water can be measured? Explain briefly by schematic diagram. — 10

(c) A catchment has seven raingauge stations. In a year, the annual rainfall values recorded by the gauges are as follows: — 5

Station	1	2	3	4	5	6	7
Rainfall (cm)	82.7	101.3	180.2	110.6	98.9	136.7	91.3

For a 10% error in the estimation of the mean rainfall, calculate the optimum number of stations in the catchment.

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BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2017
Second year, 2nd Semester

SUBJECT: HYDROLOGY

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:60)	Ma
	Answer any Four (4) question Assume relevant data if necessary	
Q1.		3 x
(i)	Distinguish between (any three)	
a)	DRH and ERH	
b)	Base flow and interflow	
c)	Aquitard and Aquifuge	
d)	Pellicular water and ground water	
e)	W-Index and φ-Index	
f)	Phearatic water table and perched water table	
(ii)	A tracer took 23 hour to travel from a well no 1 to well no 2, 325 m away from each other. Map of the water table contour shows a difference of 0.628 m in their water table elevations. The aquifer is made of mixed sandy soil with porosity of 32%. Calculate the intrinsic permeability in Darcy. Check also Reynolds number. Assume kinematic viscosity 1.12 centistokes.	
(iii)	A confined aquifer 1000 mm wide discharges 0.03 m^3/day/km to a dry river in a particular time. Determine transmissibility, if the slope of the piezometric surface is 0.75 m/km.	
2. (a)	A 300mm dia well completely penetrate a confined aquifer of permeability 45m/day. The length of the strainer is 20 m. Under steady state condition of pumping the drawdown at the well was found to be 3.0m, Radius of influence (R) is 300m, Calculate the discharge of the well. Deduce the necessary equation for solving the problem.	
(b)	Describe the different techniques of base flow separation.	

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Use a separate Answer-Script for each part

No. of Questions	Part II(Marks:60)	Marks
Q3.		
(i)	On the basis of isopluvial maps the 50 years 24hr maximum rainfall at Maldah town is found to be 46 cm. Determine the probability of 24hr rainfall of magnitude equal to or greater than 46 cm occurring at Maldah (a) At least once in 10 successive years (b) Two times in 10 successive years. (c) Once in 10 successive years.	8
(ii)	Flood frequency computation yields the following results:- Return period yrs:- 50 100 Flood flow, m3/sec:- 20500 25,400 Using Gumbels method, Estimate the probable flow for a return period of 150 years.	7
Q 4.		
(i)	Rainfall of magnitudes 3.8cm and 2,8 cm occurring on two consecutive 4 hr duration on a catchment on area 27 km2 produced the following hydrograph of flow at the outlet og the catchment. Estimate the rainfall excess and φ index. Time from Start of rainfall hr:- -6 0 6 12 18 24 30 36 42 48 54 60 66 Ordinate, m3/sec 6 5 13 26 21 16 12 9 7 5 5 4.5 4.5	7
(ii)	Prove that if the soil medium is stratified into horizontal layers having different hydraulic conductivities for each layer then equivalent Co-eff. of permeability is expressed as $K_e = \sum k_{xi} B_i / \sum B_i$ Where K_{xi} is respective permeability for 'i'th layer. B is the thickness of the layer	4
(iii)	Discuss the factors which affect the pattern of hydrograph.	4
5.		
i)	An outfall has to drain 600 ha of land with a maximum length of travel of 1.80 km. The general slope of the catamounts is 1 in 1200 and its run off Co-eff. is 0.42. Estimate the peak flow by the rational method for designing the culvert for a 50 year flood. Information on the 50 year storm is given below:- Duration in (min) – 10 15 20 30 45 60 100 Rainfall (mm) – 35 40 45 60 75 100 120	8

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No. of Questions	Part II(Marks:60)	Marks
(ii)	Discuss the components of a typical hydrograph and prove discharge at any time is proportional to storage remaining at that time.	3
(iii)	Compare the flood discharge values using following empirical formula for catchment area of 50 km^2. i) Dickens ii) Ryves Assume $C_R = 10$ $C_D = 17$	4