B.E.C.E. 2nd YEAR EXAMINATION, 2023
(2nd Semester Old)
SUBJECT: Hydrology (Old)

Full Marks 100

Time: Three hours

No. of Questions		Marks

Answer all the questions. Answer should be brief and to the point. All the notations have their usual meaning. Assume relevant data if not provided. All the relevant drawings should be in pencil.

Q1. Differentiate between: 4×5
i) Evaporation and evapotranspiration
ii) Mass Curve and Double mass curve
iii) Direct flow hydrograph and effective rainfall hyetograph
iv) Confined aquifer and unconfined aquifer
v) W-index and φ-index

Q 2.a) Describe the Hydrologic Cycle with a neat labeled sketch. 7

b) A lake had a water surface elevation of 108.5 m above datum at the beginning of a certain month. In that month the lake received an average inflow of 5 m^3 from surface runoff sources. In the same period the outflow from the lake had an average value of 6m^3/s. Further, in that month, the lake received a rainfall of 135 mm and evaporation from the lake surface was estimated as 6.5 cm. Write the water budget equation for the lake and calculate the water surface elevation of the lake at the end of the month. The average lake surface area can be taken as 7500 ha. Assume that there is no contribution to or from the groundwater storage. 6

c) The 25 year 24 hr maximum rainfall at Kolkata is 150 mm. Determine the probability of a 24 hr rainfall of magnitude equal to greater than 150 mm at Kolkata occurring (a) once in 15 successive years (b) at least one in 15 successive years (c) not occurring in 15 successive years 7

Q 3.a) 2 storms each of 6h duration and having rainfall excess 4cm and 3cm respectively occur successively. The 3cm effective rainfall follows the 4cm rain. Calculate the resulting direct runoff hydrograph graphically. 8

Time (h)	0	3	6	9	12	15	18	24	30	36	42	48	54	60	69	75
Ordinate of 6-h UH (m^3/s)	0	25	50	85	125	160	185	160	110	60	36	25	16	8	0	0

b) Discuss the factors which affect the pattern of hydrograph. 5

c) With neat sketches describe the different techniques of base flow separation. 7

Q4.a) With neat sketch, deducing the expression for a 30 cm dia well completely penetrating in confined aquifer of depth 25m at a steady state condition determine the drawdown in the well when coefficient of permeability is 45m/d, radius of influence is 350m and constant rate of discharge is 42lps. 2+5+3

b) **Discuss the following parameters related to aquifer**: specific yield, intrinsic permeability, transmissivity, storage coefficient, specific storage 2×5

Ref No. – EX/CE/T/224/2023

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Q5. a)	**Match the following:**	

Column A	Column B
Evaporation	Penman's equation
Infiltration	Symon's gauge
Evapotranspiration	Horton's equation
Precipitation	Current meter
Stream flow	Meyer's formula

1×5

b) Discuss the advantages and disadvantages of electromagnetic method for stream flow measurement. 5

c) Discuss two factors to choose the streamgauge stations for stream flow measurement by area velocity method. 1×2

d) A 200 g/l solution of common salt was discharged into a stream at a constant rate of 25l/s. The background concentration of the salt in the stream water was found to be 10 ppm. At a downstream section where the solution was believed to have been completely mixed, the salt concentration was found to reach an equilibrium value of 45ppm. Estimate the discharge in the stream with neat schematic diagram of concentration change with time. 5

e) Among the different methods present for determining average precipitation which method do you think is most advantageous? Write two factors in support of your answer. 1+2