

Ref No. -Ex/CE/5/T/204/2017

B.E.C.E. (PART TIME) 2<sup>nd</sup> YEAR EXAMINATION, 2017  
(2<sup>nd</sup> Semester)  
SUBJECT: Hydrology

Time: Three hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	Part I	Marks												
	<b>Answer question no.1 (compulsory) and any three from the rest. Assume relevant data if necessary.</b>													
Q1. a)	<b>Fill in the blanks:</b>	1×10												
i.	In tropical cyclone in the northern hemisphere the wind flows in _____ direction.													
ii.	A plot between rainfall intensity versus time is called _____													
iii.	The size of Colorado sunken pan: Length is _____ depth is _____													
iv.	_____ is found to be most suitable chemical as water evaporation inhibitor													
v.	The SI unit commonly used for stream discharge measurement is _____													
vi.	The instrument used for measuring stream velocity is _____													
vii.	Full form of AET is _____													
viii.	The name of non-recording type of rain gauge used in India is _____													
ix.	Theissen polygon method is used to calculate _____ of a catchment area													
x.	The probability of occurrence of 50 year 24 hour maximum rainfall equal to or greater than 200 mm in Kolkata is _____													
b)	<b>Distinguish between</b>	2.5×4												
i.	Orographic precipitation and convective precipitation													
ii.	Infiltration rate and infiltration capacity													
iii.	PET and PMP													
iv.	Field capacity and permanent wilting point													
Q 2. a)	Write the effect of vapour pressure and temperature on evaporation process of a water body.	2×2												
b)	In a year the annual rainfall recorded by the rain gauge stations for a catchment area covers 110 km <sup>2</sup> are as follows:	6												
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Station</th> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> <th style="text-align: center;">D</th> <th style="text-align: center;">E</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Precipitation</td> <td style="text-align: center;">1100</td> <td style="text-align: center;">890</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">1370</td> <td style="text-align: center;">1805</td> </tr> </tbody> </table>	Station	A	B	C	D	E	Precipitation	1100	890	1000	1370	1805	
Station	A	B	C	D	E									
Precipitation	1100	890	1000	1370	1805									
	Check whether the five rain gauge stations are sufficient for the catchment area when acceptable permissible error is 10%. If not then determine the number of additional raingauge stations.													
Q 3. a)	List two major activities in which hydrological studies are important. What is $\phi$ -index?	2+3												
b)	A reservoir had an average surface area of 20 km <sup>2</sup> . In a month the mean rate of inflow is 10 m <sup>3</sup> /s, outflow 15m <sup>3</sup> /s, monthly rainfall 10cm and change in storage 16 Mm <sup>3</sup> . Assuming the seepage losses to be 1.8cm, estimate the evaporation in that month.	5												

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Q 4. a)	Write two factors affecting interception loss.																			
b)	Results of an infiltrometer test on a soil are given below. Determine the Horton's infiltration capacity equation for the soil graphically.  <div style="text-align: center;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">Time since start(h)</td> <td style="padding: 5px;">0.25</td> <td style="padding: 5px;">0.5</td> <td style="padding: 5px;">0.75</td> <td style="padding: 5px;">1.0</td> <td style="padding: 5px;">1.25</td> <td style="padding: 5px;">1.5</td> <td style="padding: 5px;">1.75</td> <td style="padding: 5px;">2.0</td> </tr> <tr> <td style="padding: 5px;">Infiltration capacity</td> <td style="padding: 5px;">5.6</td> <td style="padding: 5px;">3.2</td> <td style="padding: 5px;">2.1</td> <td style="padding: 5px;">1.5</td> <td style="padding: 5px;">1.2</td> <td style="padding: 5px;">1.1</td> <td style="padding: 5px;">1.0</td> <td style="padding: 5px;">1.0</td> </tr> </table> </div>	Time since start(h)	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0	Infiltration capacity	5.6	3.2	2.1	1.5	1.2	1.1	1.0	1.0	
Time since start(h)	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0												
Infiltration capacity	5.6	3.2	2.1	1.5	1.2	1.1	1.0	1.0												
Q5.a)	Why two step method is used for streamflow measurement?																			
b)	How will you measure the stream flow by using area-velocity method? Write the steps only with a neat sketch.																			
c)	Write a disadvantage of dilution technique of river discharge method.																			

**BACHELOR OF CIVIL ENGINEERING (PART TIME) SECOND YEAR SECOND SEMESTER  
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**HYDROLOGY**

Marks

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No. of questions	Part II(HALF)	Marks
<i>Answering of Question no. 1 is mandatory and any two questions from remaining four. Assume reasonable values of data, if not supplied.</i>		
1. A.		1x5
(i)	The dimensions of the coefficient of transmissibility T are (a) $L^2/T$ (b) $L^3T^2$ (c) $L/T^2$ (d) $T/L^2$	
(ii)	A stream that gaining water from banks water table is termed as (a) Affluent (b) Influent (c) Ephemeral (d) Effluent.	
iii)	The permeability of a soil sample at the standard temperature of $20^{\circ}C$ was 0.01cm/Sec. The permeability of the same material at a flow temperature of $10^{\circ}C$ is in cm/sec (a) $<0.001$ (b) $> 0.01$ (c) $= 0.01$ (d) depends upon the porous material.	
iv)	A sand sample was found to have a porosity of 40%. For an aquifer of this same material, the specific yield is (a) $=40\%$ (b) $> 40\%$ (c) $<40\%$ (d) depend upon the clay fraction.	
v)	The dimension of the Storage Coefficient is (a) $L^4$ (b) $LT^{-2}$ (c) $L^3/T$ (d) Dimensionless	4
B.	(a) Draw a schematic diagram of subsurface water with brief descriptions. (b) What are reasons of failure in a Tubewell?	3
C.	Explain the followings (a) Maximum depression head; (b) Gravel Packing;	2x2
2. (a)	In the experimental setup shown in figure given below, if the area of cross-section of the soil sample be $0.3m^2$ and the discharge flowing through it be 0.05cusec, determine the co-efficient of permeability in m/day.	10

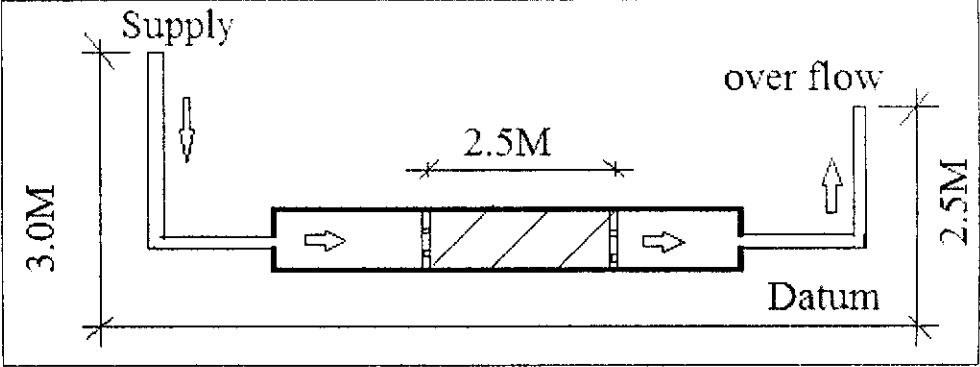
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(b)	<p>Derive an expression among <math>v = \frac{v'}{n}</math>, where <math>v</math> is actual velocity of flow; <math>n</math> is porosity and <math>v'</math> is superficial velocity of flow.</p>	7
3. (a)	<p>A pumping out test was carried out in a 20m thick layer of pervious soil which is underlain by impermeable shale. The water table was located at 1.0m below the gl. a steady state was reached when the discharge from the well was 9cumec. The corresponding water levels in two observed wells situated at 4.5 and 8.3m from the pumped well were found to be 2.2m 0.6m respectively below the initial ground water table. So, what is co-efficient of permeability of this deposited soil?</p>	13
(b)	<p>Explain well losses and well efficiency.</p>	2x2
4. (a)	<p>What length of strainer is required to obtain a design discharge for an unconfined aquifer? Where <math>s</math>; <math>k</math>; <math>h_w</math>; <math>r_w</math>; <math>R</math> and <math>d</math> are drawdown; co-efficient of permeability; length of strainer; well radius; radius of influence and saturated thickness of aquifer respectively.</p>	10

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No. of questions	Part II(HALF)	Marks
(b)	Design a Tubewell diameter to deliver of 150150 liters per hours of water, assuming suitable velocity of flow. Again design the actual velocity of flow in pipe and what will be the size of bore?	4+2+1=7
5.	In an artesian aquifer, the drawdown is 1.3m at a radial distance of 15m from a pumped well after three (3) hours of pumping. On the basis of non-equilibrium equation, determine the pumping time for the same drawdown at a radial distance of 32m from the main pumped well.	17