

**BACHELOR OF ENGINEERING (CIVIL ENGINEERING) SECOND YEAR FIRST SEMESTER EXAM 2019
(Old)**

Hydrology

Time: Three Hours

Full Marks 100
(50 marks for this part)

Use a separate Answer-Script for each part

No. of questions	Part I	Marks
<i>Answering of Question no. 1 is mandatory and any two questions from remaining three. Assume reasonable values of data, if not supplied.</i>		
1.	Define the following with figure if necessary, (i) Artesian Aquifer (ii) Porosity (iii) Hydraulic gradient or surface leakage (iv) Permeability or Transmissibility (v) Darcy's Law (vi) Gravel Packing of water wells	6x3=18
2.	Determine the co-efficient of permeability for fine grain soil through laboratory test with proper explanation and figure.	16
3.	A 0.4m dia. well is pumped at a uniform rate of $0.045\text{m}^3/\text{sec}$. from the pumping well for 24hr. While observations of drawdown from observation wells were located at distance 2.5m and 6.5m from the main pumped well are 3.6m and 1.7m respectively. Depth of well 20m from ground level (GL) and water table 4m from GL. Find coefficient of permeability and transmissibility along with velocity of water.	8+4+4=16
4.	i) Enumerate the different methods which are used for drilling of wells for water supply. ii) What is the average life of tube wells and what are the reasons for their failure? iii) What is the range of entrance velocity near the well screen for the long life of tube well?	5 2 1
	iv) In a field test a time of 6hours was required for a tracer to travel through an aquifer from one well to another. The observation wells were 42m apart and the difference in their water levels was found to be 0.420m. The porosity of the soil medium was 0.20. Compute i) the discharge velocity; (ii) the co-efficient of permeability.	4+4=8

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Q No.	Part II	Marks																					
	Answer question no.1 (compulsory) and any three from the rest. Assume relevant data if necessary.																						
Q1. a)	Fill in the blanks: i. For anti-cyclone, in the northern hemisphere the wind flows in _____ direction. ii. A plot between rainfall of equal intensity is called _____ iii. The diameter of Class A landplan evaporimeter is _____ iv. The most suitable chemical used as water evaporation inhibitor is _____ 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 nonrecording type of rain gauge used in India is _____ ix. Isohyetal method is used to calculate _____ of a catchment area x. The probability of occurrence of 35 year 24 hour maximum rainfall equal to or greater than 200 mm in Kolkata is _____	1×10=10																					
b)	Distinguish Between: i. Mass curve and Hyetograph ii. Permanent wilting point and field capacity iii. PET and PMP iv. Evaporation and Evapotranspiration	2.5 ×4=10																					
Q 2.a)	Write the effect of mean monthly temperature and atmospheric pressure on evaporation process of a water body. Why pan coefficient is multiplied with the result obtained from evaporimeter to get exact evaporation?	2×2+1																					
b)	The catchment area of a reservoir is 20 km ² . A uniform precipitation of 0.5 cm/h for 2 h was observed on 1 st September, 2018. 50% of the runoff reached the reservoir. A canal carrying a discharge of 1.25m ³ /s is taken from the reservoir. The rate of evaporation observed was 0.7 mm/m ² /h. The seepage loss was observed to be 50% of the evaporation loss. Find the level of the reservoir level on 1 st September from 8 am to 6 pm. Consider the area of the reservoir is 0.475km ² .	5																					
Q3.a)	Write a short note on Thiessen method for calculating average rainfall for a particular catchment area.	5																					
b)	The average annual precipitation at six raingauges in a catchment area and rainfall recorded during 2018 at six raingauges are presented in the table since one rainauge was non-operated at that year. Determine the rainfall at the non-operated rainauge station during 2018.	5																					
	<table border="1"> <thead> <tr> <th>Station</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> </tr> </thead> <tbody> <tr> <td>Annual average rainfall(mm)</td> <td>2400</td> <td>2332</td> <td>2431</td> <td>2207</td> <td>2231</td> <td>2500</td> </tr> <tr> <td>Rainfall during 2017 (mm)</td> <td>2320</td> <td>2113</td> <td>2200</td> <td>2028</td> <td>2095</td> <td>?</td> </tr> </tbody> </table>	Station	A	B	C	D	E	F	Annual average rainfall(mm)	2400	2332	2431	2207	2231	2500	Rainfall during 2017 (mm)	2320	2113	2200	2028	2095	?	
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Q4. a)	Write a short note on ϕ -index.	5
b)	What is infiltration capacity? Discuss briefly three factors affecting the infiltration capacity of an area.	2+3
Q5. a)	A 200 g/L solution of common salt was discharged into a stream at a constant rate of 25 L/s. The background concentration of salt in the stream water was found to be 10 ppm. At a downstream section where the solution was believed to be completely mixed, the salt concentration was found to reach an equilibrium value of 45 ppm. Estimate the discharge in the stream using dilution technique of flow measurement.	5
b)	Deduce the expression for calculating stream discharge using ultrasonic method with a neat sketch.	5