Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Programme Name: B TECH CIVIL ENGINEERING **Semester : VI**
Course Name : Water Resources Engineering **Time : 03 hrs**
Course Code : CIVL 3008 **Max. Marks : 100**
Nos. of page(s) : 3
Instructions: Attempt all the questions and assume the necessary data within suitable limits

Set A

SECTION A

S. No.		Marks	CO
Q1	On the basis of isopluvial maps the 50 year-24 hour maximum rainfall at Bangalore is found to be 16.0 cm. Determine the probability of a 24 h rainfall of magnitude 16.0 cm occurring at Bangalore:(a)Once in ten successive years.(b)Twice in ten successive years.(c)At least once in ten successive years.	**4**	**CO1**
Q2	A class A pan was set up adjacent to a lake. The depth of water in the pan at the beginning of a certain week was 195 mm. In that week there was a rainfall of 45 mm and 15mm of water was removed from the pan to keep the water level within the specified depth range. If the depth of the water in the pan at the end of the week was 190 mm, calculate the pan evaporation. Using a suitable pan coefficient estimate the lake evaporation in that week.	**4**	**CO1**
Q3	The infiltration process at capacity rates in a soil is described by Kostiakov's equation as: $\mathbf{F_p = 3.0t^{0.7}}$ Where, F_p is cumulative infiltration in cm and t is time in hours. Estimate the infiltration capacity at 3.0 h from the start of infiltration.	**4**	**CO2**
Q4	What is the classification of irrigation water having the following characteristics: concentrations of Na, Ca and Mg are 22, 3 and 1.5 mEq per litre respectively and the electrical conductivity is 200 micro mhos per cm at 25^{0}C?	**4**	**CO3**
Q5	Explain the advantages of sprinkler irrigation.	**4**	**CO3**
	SECTION B		
Q6	A catchment has four sub-areas. The annual precipitation and evaporation from each of the sub-areas are given below. Assume that there is no change in the groundwater storage on an annual basis and calculate for the whole catchment the values of annual average (i) precipitation, and (ii) evaporation. What are the annual runoff coefficients for the sub-areas and for the total catchment taken as a whole?	**10**	**CO1**

Sub-Area	Area Mm^2	Annual Precipitation (mm)	Annual Evaporation (mm)
A	10.7	1030	530
B	3	830	438
C	8.2	900	430
D	17	1300	600

	OR		
Q6	Explain a procedure for supplementing the missing rainfall data with the help of an example.	**10**	**CO1**
Q7	Given the following data about a catchment of area 100 km2, determine the volume of surface runoff and peak surface runoff discharge corresponding to a storm of 60 mm in1 hour.	**10**	**CO2**
Q8.	From the data given below, find the flood discharge for a return period for of 1000 years.	**10**	**CO2**
Q9.	800 m^3 of water is applied to a farmer's rice field of 0.6 hectares. When the moisture content in the soil falls to 40 % of the available water between the field capacity (36 %) of soil and permanent wilting point (15%) of the soil crop combination, determine the field application efficiency. The root zone depth of rice is 60cm. Assume porosity = 0.4	**10**	**CO3**

Time (h)	0	1	2	3	4	5
Rainfall (mm)	0	40	0	0	0	0
Runoff (m^3/s)	300	300	1200	450	300	300

Return period (Years)	Peak Flood (m^3/s)
100	435
50	395

SECTION-C

Q10	a) An irrigation channel is to be constructed in coarse alluvium gravel with D-75 size of 5cm. The channel has to carry discharge of 3 cumecs and the longitudinal slope is 0.01. The banks of channel will be protected by grass against scouring. Find the minimum width of the channel. b) Design a regime channel for a discharge of 50 cumecs and silt factor1.1 using Laceys's theory.	**10+10**	**CO4**
	OR		
Q10	Design an irrigation channel to carry 40 cumecs of discharge with base to width ratio of 2.5. The critical velocity ratio is 1. Assume a suitable value of Kutter's rugosity coefficient and use Kennedy's method.	**20**	**CO4**
Q11	What are the objectives of river training works? With the help of a neat diagram discuss the factors governing the design of top level, shape, length, radius and slope pitching of Guide banks.	**5+15**	**CO5**

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Set B

SECTION A

S. No.		Marks	CO
Q1	Consider the statement: The 100 year-24 hour maximum rainfall at Bangalore is 1600 mm. What do you understand by this statement?	**4**	**CO1**
Q2	What is the role of evapotranspiration in plant physiology?	**4**	**CO1**
Q3	Why is base flow separated from the flood hydrograph in the process of developing a unit hydrograph?	**4**	**CO2**
Q4	Explain the advantages of drip irrigation.	**4**	**CO3**
Q5	Find the delta for a crop when its duty is 864 km^2/cumecs on the field, the base period is 10 weeks.	**4**	**CO3**

SECTION B

Q6	Results of an infiltrometer test on a soil are given below. Determine the Horton's infiltration capacity equation for this soil.	**10**	**CO2**

Time since start in minutes	5	10	15	25	40	60	75	90	110	130
Cumulative infiltration in mm	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0

Q7	Flood –frequency analysis for the river Chambal at Gandhisagar dam, by using Gumbel's method, yielded the following results: **Return period (Years)** / **Peak Flood (m^3/s)**: 100 / 435; 50 / 395 Estimate the magnitude in this river with a return period of 500 years.	**10**	**CO2**
Q8	The normal annual precipitation of five rain-gauge stations P, Q, R, S and T are respectively 125, 102, 76, 113 and 137 cm. During a particular storm the precipitation re-corded by stations P, Q, R, and S are 13.2, 9.2, 6.8 and 10.2 cm	**10**	**CO1**

	respectively. The instrument at station T was inoperative during that storm. Estimate the rainfall at station T during that storm.		
	OR		
Q8	Explain a procedure for checking a rainfall data for consistency with the help of an example and a graph.	**10**	**CO1**
Q9.	Determine the field capacity of a soil from the following data: a) Depth of root zone = 1.8m b) Existing moisture = 8% c) Dry density of soil = 1450 kg/m^3 d) Quantity of water applied to soil = 650 m^3 e) Water lost in deep percolation and evaporation = 10 % f) Area to be irrigated = 1000 m^3	**10**	**CO3**
	SECTION-C		
Q10	The following hydraulic data pertains to a bridge site of a river: Max. Discharge = 6000 cumecs HFL = 104m River Bed Level = 100m Average diameter of river bed material = 0.1m Design and sketch Bell's Bunds including the launching apron to train the river.	**20**	**CO5**
	OR		
Q10	a) The head regulator of a canal has 3 openings 3m wide. The water is flowing between the upper and lower gates. The vertical opening of the gates is 1m. The head on the regulator is 0.45m (Afflux). If the u/s water level rises by 0.2m, find how much the upper gates must be lowered to maintain the canal discharge unaltered. b) Discuss the various losses in tunnels and discuss their equations.	**10+10**	**CO5**
Q11	A canal is to be designed to carry a discharge of 56 cumecs. The slope of the canal is 1 in 1000. The soil is coarse alluvium having a grain size of 5cm. assuming the canal to be unlimited and of a trapezoidal section, determine a suitable section for the canal, Φ may be taken as 37^0.	**20**	**CO4**