B.E. CONSTRUCTION ENGINEERING SECOND YEAR FIRST SEMESTER EXAM 2019

Subject: WATER RESOURCES ENGINEERING

Time: Three hours **Full Marks 100**

Different parts of the same question should be answered together.

Part I

CO1 [5]	[1] Answer any one from (a) and (b) in this block a. Indicate the drinking water quality standard for the following characteristics of water—(i) Colour (ii) Turbidity (iii) Total solid (iv) nitrate content (v) iron content (vi) pH value, (vii) Arsenic content (viii) Fluoride content. b. Make out a list of water borne diseases noting the impurities against each as the cause for the disease. [5]
CO2 [15]	[2] (a) What is BOD? Deduce an expression for BOD with time. What are the factors on which the De-oxygenation constant (K) depends? (b) The BOD of a sewage incubated for one day at 30°C has been found to be 130 mg/l. What will be the 5 day 20°C BOD? Assume K = 0.14 (Base 10) at 20°C. [10+5]
CO3 [10]	*Answer any* **two(2)** from **(a), (b) and (c)** *in this block:* [5+5] [3] [a] Write short notes on any two of the following with neat sketches: (i) Drop Manholes.(ii) Inverted syphon. (iii) Lamp hole b.Enlist various sewer appurtenances and write short note on any one. c. Discuss importance of manholes in sewerage system and describe with sketch deep manhole.
CO4 [10]	*Answer any* **one(1) from (a) and (b)** *in this block:* 4. (a) Explain the biological treatment techniques for treating waste-water **OR** Activated Sludge Process. © Discuss the detail construction and operation of rapid gravity filter during filtration and back washing. c. Draw a complete flow diagram of wastewater treatment plant and describe the function of its each unit. [10]

CO5 [2+8]	Answer **all** question from this block: 5. (a) Explain the importance of the following in the design of sewer (i) Self-cleansing velocity (ii) Non-scouring velocity (b) Design a sewer running 0.7 times full at maximum discharge for a town provided with the separated system, serving a population of 80,000 persons. The water supplied from the water works to thee town is at a rate of 190litres/person/day. The sewer is made up of brick work plastered smooth with cement mortar (n = 0.013) and the permissible slope is 1 in 600. The variations of n with depth may be neglected. Assume any other data not given and needed. [2+8]

Course objectives:

CO1: To define the different important water quality parameters, their relevance to human health and in treatment processes and their permissible limits as per the standards and hydrologic cycle.(K1)

CO2: To estimate physical, chemical and biological water quality parameters in laboratory and also precipitation. (K2)

CO3: To illustrate basic concepts of wastewater generation, collection system, wastewater quality and standards and compute stream flow measurement, components of run-off (K3).

CO4: To classify various methods of waste water treatment and outline stage.(K4).

CO5: To develop discharge relationship its significance methods for design of sewerage system components, construction methodologies of sewerage system and hydrograph and ground water hydrology (K3).

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Sub.: Water Resources Engg. (Part – I)

Answer Q. No. 1 and any two from the rest.

1. (CO4 & CO5) (A) Write **TRUE** or **FALSE:** 1 x 5

   a) For estimating the missing precipitation data P_x, there is no importance of the average annual rainfall of the unknown station (x).

   b) Ranking of the storm is the product of recurrence interval and total number of years on record.

   c) In case of moderate rain of uniform intensity, the W_{index} will be higher than φ_{index}.

   d) In Thiessen's mean method, the contours of rainfall data are used.

   e) In order to obtain the surface runoff graph from the runoff hydrograph, the base flow is not required.

B) Write short notes on the following: 1 x 5

   i) Rain gauges

   ii) Measurement of velocity of a stream

   iii) Estimation of missing rainfall data

   iv) Hydrology

   v) Hyetograph

2. (CO3) a) State which one is higher among φ_{index} and W_{index} and why? Explain with neat sketch. Can they ever be equal?

   b) A storm with a15.0 cm precipitation produces a direct runoff of 8.7 cm. The time distribution of the storm is as follows:

Time from start in hr	1	2	3	4	5	6	7	8
Incremental rainfall in each hr in cm	0.6	1.35	2.25	3.45	2.7	2.4	1.5	0.75

Estimate the φ_{index} of the storm. Draw necessary plot on graph paper. 5 + 15

3. (CO2) a) What do you mean by recurrence interval of time? Explain giving a suitable example.

b) The maximum values of 24 hours summer precipitation at a rain gauge station expressed in cm from 2003 to 2017 are indicated below:

10.7 11.2 10.8 9.6 14.9

15.2 12.0 12.2 15.8 16.8

9.7 11.3 11.6 11.9 12.4

Estimate the maximum precipitation having a recurrence interval of (a) 5 years, (b) 10 years and (c) 20 years. Draw necessary plot on graph paper. 5 + 15

4. (CO5) (a) What is a unit hydrograph?

(b) In a certain basin, ordinates of a unit hydrograph (1cm – 6 hr) are given below:

Time (in hr)	0	6	12	18	24	30	36	42	48
Ordinates (cumecs)	0	4	12	25	18	12	7	4	0

Determine the peak flood and the total volume of flood flow in the basin corresponding to storm described below from plotted graphs:

Period (h)	0 -6	6- 12
Runoff (mm)	10	20

Base flow at the time of storm was 5 cumecs. 2 + 18

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CO3: To illustrate basic concepts of wastewater generation, collection system, wastewater quality and standards and compute stream flow measurement, components of run-off (K3).

CO4: To classify various methods of waste water treatment and outline stage discharge relationship and its significance (K4).
CO5: To develop methods for design of sewerage system components, construction methodologies of sewerage system and hydrograph and ground water hydrology (K3).