



II SEMESTER M.TECH. END SEMESTER EXAMINATIONS APR-MAY 2019

SUBJECT: INDUSTRIAL WASTEWATER ENGINEERING [CHE 5235]

REVISED CREDIT SYSTEM (02/05/2019)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.

Predict the population for the year 2021, 2031, and 2041 from the following **06** population data using arithmetical increase, geometrical increase and incremental increase method. Write down the formula and make table for each method.

1A.	Year	1961	1971	1981	1991	2001	2011	
	Population	8,58,545	10,15,672	12,01,553	16,91,538	20,77,820	25,85,862	
	Hint: The geometric mean of a data set $\{a_1.a_2a_n\}$ is given by: $(a_1.a_2a_n)^{1/n}$							
1 B .	Discuss the In-line and Off-line flow equalization with example. Write two							
	applications of variable volume and constant volume equalization basins.							
1C.	State two benefits of using flow equalization in wastewater treatment systems.						01	
2A.	Discuss two non-chemical disinfection process to make the water pathogen free.							
	State the advantages and disadvantages for each cases.							
2B.	Discuss in detail the different transport mechanisms of particles in rapid sand							
	filtration process with diagram.							
2C.	Explain how the rate of metabolism will vary with changes in F/M ratio in case of							
	continuously feed biological reactor. Draw a diagram to support it.							
3A.	Write a short note of trickling filter along with a schematic diagram.							05
3B.	What is Facultative stabilization pond and Moving Bed Biofilm Reactor (MBBR)?							
	Discuss with a schematic representation.							03



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4 A.	Discuss the 3 main steps of anaerobic biological conversion of organic waste by anaerobic degradation process.						
4B.	Examine in detail the possible advantages and disadvantages of anaerobic decomposition process.						
4C.	Write a short note on Ion exchange and Denitrification process as a tertiary treatment process of industrial waste water.						
5A.	Write a short review on different physical, chemical and biological processes to treat petroleum refinery waste water.						
5B.	A low rate digester is to be designed for waste sludge generated from activated sludge process treating sewage generated from 25000 persons. The fresh sludge has 0.11 kg dry solids/capita- day (VS = 70 % of ds). The dry solids (DS) is 5% of the sludge and specific gravity is 1.01. During digestion 65% of VS are destroyed and fixed solids remained unchanged. The digested sludge has 7% DS and a wet specific gravity is 1.03. Operating temperature of digester is 35° C and sludge storage time is 45 days. Determine the digester volume required. Assume digestion time of 23 days.						

--- All the best ---