Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 171301 **Date: 24/05/2012**

Subject Name: Advanced Wastewater Treatment Technologies

Time: 02:30 pm – 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Enlist the pollutants which need to be removed by 'Advanced Waste water treatment'. Explain your objections if they are not controlled. **07**

(b) What is adsorption? What are the factors on which adsorption depends ? **07**

Q.2 **(a)** Differentiate between 'Tertiary treatment' and 'Advanced Waste water Treatment', with the help of a neat sketch. **07**

(b) An adsorption study is set up in the laboratory by adding a known amount of activated carbon to five flasks which contain 1000 mL of wastewater. An additional flask containing 1000 mL sample but no carbon is run as blank. Plot the data as per Langmuir isotherm and determine the values of constants a and b. **07**

Flask no	Weight of Activated carbon mg	Volume in flask mL	COD , mg/L
1	0	1000	200
2	1.5	1000	50
3	7.3	1000	16.7
4	11.5	1000	7.7
5	11.7	1000	5.6
6	17.6	1000	4.0

OR

(b) Define the terms: **07**

(i) Adsorbate (ii) Adsorbent (iii) Physical adsorption
(iv) Chemical adsorption (v) Pore diffusion (vi) Film diffusion
(vii) Exchange adsorption

Q.3 **(a)** With the help of a neat sketch explain the construction and working of 'Membrane Bioreactor'. **10**

(b) Explain the terms: (i) Trans membrane pressure (ii) Retentate (iii) Permiate (iv) Flux. **04**

OR

Q.3 **(a)** Differentiate between : **06**

(i) Maintenance cleaning and Recovery cleaning.
(ii) External MBR and Immersed MBR

(b) What is "Advanced Oxidation" process ? Enlist and explain the different Advanced oxidation processes for treatment of concentrated wastewaters. **08**

Q.4 **(a)** Which are the unit processes and unit operations which fall under 'Advanced wastewater treatment'? High light the purpose of each. **07**

(b) Enlist and explain the concept of Ion exchange for water and wastewater treatment. Also enlist its applications for water and wastewater treatment. **07**

OR

Q.4 **(a)** Explain the applications of membrane technologies in wastewater treatment. **07**

(b) With the help of a neat sketch explain the construction and working of any one sludge dewatering equipment. **07**

Q.5 **(a)** A water has following constituents expressed as m eq/L : **10**

Ca^{2+} =4.6 Mg^{2+} =1.0 Na^{+}=2.1 HCO_3^{-} = 2.4 SO_4^{2-} =2.9 Cl^{-} =2.4

(i) Check if the ions are balanced. Draw the bar diagram.

(ii) What is the total hardness expresses as $CaCO_3$?

(iii) Water is to be treated to a final hardness of 80 mg/L as $CaCO_3$. Select appropriate method and calculate the chemical requirements for a flow of 25000 m^3/d?

(b) With the help of a neat diagram explain the process of resin regeneration. **04**

OR

Q.5 **(a)** Write a note on biological nitrogen removal processes. **07**

(b) Explain the chemical precipitation method for phosphorus removal. **07**

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