

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE – SEMESTER- VII EXAMINATION-SUMMER 2023****Subject Code: 3171309****Date: 19/06/2023****Subject Name: Advanced Wastewater Treatment Technologies****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Write the applications of advanced wastewater treatment for water treatment. **03**
- (b) Differentiate between advanced treatment and tertiary treatment for Waste water. **04**
- (c) Explain nitrification and de-nitrification with detailed chemistry Process mentioning species of microorganisms involved. **07**

- Q.2** (a) With the help of neat diagram. Explain the process of Resin regeneration. **03**
- (b) Explain the microbiology involved in biological process of phosphorous Removal. **04**
- (c) Write a short note on 'Water Softening'. Enlist and explain the different types of softening processes. **07**

**OR**

- (c) Enlist and explain the concept of Ion exchange for water and Waste water treatment. Also enlist its applications for water and Waste water treatment. **07**
- Q.3** (a) Enlist the Advantages & Disadvantages of "Ultra filtration" & "Microfiltration". **03**
- (b) Enlist chemical methods of phosphorous removal and explain any one method with equations and the process configurations. **04**
- (c) Explain the process of Electro-dialysis with neat sketch. Also summarize its advantages and disadvantages. **07**

**OR**

- Q.3** (a) Explain external MBR and submerged MBR with figure. **03**
- (b) With the help of neat Sketch Explain the concept of "RO" **04**
- (c) Explain the photo fenton process with equations. Highlight the advantages and disadvantages of photo fenton process over fenton process. **07**

- Q.4** (a) Enlist the factors affecting ion-exchange process. **03**

- (b) With the help of neat sketches explain the procedure of membrane cleaning of MBR. 04
- (c) With the help of a neat sketch explain the construction and working of 'Membrane Bioreactor'. 07

**OR**

- Q.4**
- (a) List the characteristics of good adsorbent. 03
  - (b) Prepare a list of adsorbents and mention applications of each. 04
  - (c) Explain advantage and disadvantages of Advanced oxidation process which use combination of hydrogen peroxide and ozone. 07

- Q.5**
- (a) Explain different types of micro porous membranes with figure. 03
  - (b) Highlight the importance of Adsorption Isotherms stating Their Applications. 04
  - (c) Prepare a list of unit processes and unit operations which fall under 'Advanced wastewater treatment' along with the purpose of each. 07

**OR**

- Q.5**
- (a) Enlist the operating parameters to be maintained during electro-coagulation and explain any one parameter. 03
  - (b) Give difference between electro-coagulation and chemical coagulation. 04
  - (c) What is membrane fouling? Explain spiral wound membrane with figure. 07

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