

**GUJARAT TECHNOLOGICAL UNIVERSITY****M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2013****Subject code: 731801****Date: 13-05-2013****Subject Name: Advanced Wastewater Treatment Technologies****Time: 10.30 am – 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.

**Q.1 (a)** Define sludge. Explain why it is considered to be a problem at treatment plant. **05**

- (b)** (i) Enlist and briefly explain any two sludge dewatering techniques. **09**  
(ii) Define and differentiate between preliminary and primary treatment.

**Q.2 (a)** Define reuse and recycling of water. Highlight the importance of reuse and recycling in the present water scarcity scenario. **07**

- (b)** Enlist and explain the effects of discharging the wastewaters with residual oxygen demand into the river. **07**

**OR**

- (b)** Draw a neat diagram showing all the possible treatment units at conventional sewage treatment plant with tertiary units. Classify and arrange the units under different treatment categories. **07**

**Q.3 (a)** Enlist the limitations of using the hard water. Define and describe ion exchange process as a method for removal of hardness. **08**

- (b)** Answer the following questions: **06**  
(i) Why it is not possible to achieve zero hardness with chemical precipitation softening?  
(ii) Hard waters are not health hazards. Give your comments.  
(iii) When would you prefer electrodialysis as the preferred method of softening?

**OR**

**Q.3 (a)** (i) Explain how hardness enters the water under natural conditions. **07**  
(ii) Briefly explain the method of equilibrium diagram to calculate the chemical dosages required for water softening.

- (b)** Explain briefly the types of hardness and their removal techniques. **07**

**Q.4 (a)** With the help of a neat sketch explain the different components of Membrane Bioreactor. **10**

- (b)** Prepare a list of advantages and limitations of Membrane Bioreactor.. **04**

**OR**

**Q.4 (a)** With the help of a neat sketch write a note on Reverse Osmosis along with advantages and disadvantages. **07**

**Q.4 (b)** Write a short note on Electrodialysis along with a neat sketch. **07**

**Q.5 (a)** Draw a neat sketch and write short notes on (any one): **07**

- (i) Rotary drum filter  
(ii) Plate and frame Filter press

- (b)** Differentiate between: **07**

- (i) External and immersed MBR.  
(ii) Maintenance cleaning and recovery cleaning

**OR**

- Q.5** (a) Prepare a list of Advanced Oxidation processes and explain any one in detail. **07**
- (b) Enlist and elaborate the objections to the presence of refractory organics in the treated effluent to be discharged in to environmental sinks. **07**

\*\*\*\*\*