P. P. SAVANI UNIVERSITY

Fifth Semester of B.Sc. Examination
December-2021
SSES3030–Advanced Wastewater Treatment Technologies II
08.12.2021, Wednesday Time: 12:30 p.m. to 03:00p.m. Maximum Marks: 60

Instructions:
1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Ion exchange process is also called as _____
- **A** Permutit's process
- **B** Demineralization
- **C** Zeolite process
- **D** Lime soda process

1.1b The _____ is reduced by the ion exchange process.
- **A** Hardness
- **B** Phosphates
- **C** VOC
- **D** Colloidal Particles

1.1c Ion exchange process is the clean process because it has _____
- **A** Sludge formation
- **B** No sludge formation
- **C** Little sludge formation
- **D** Other precipitates are formed

1.1d In ion exchange process the cation exchange resin is generated by passing _____
- **A** Acids
- **B** Dilute acids
- **C** Alkalis
- **D** Dilute alkalis

1.1e MBR is the combination of _____and _____.
- **A** Secondary Clarifier
- **B** Filtration
- **C** Both A and B
- **D** Microfiltration and Ultrafiltration

1.1f What is the unit of influent flow rate?
- **A** md
- **B** m/d
- **C** m^2/d
- **D** m^3/d

1.1g MBR stands for

A Membrane Bireactor
B Moving Bed Reactor
C Membrane Bio Reactor
D Moving Bio Reactor

1.1h The regeneration of acids and alkalis in ion exchange process is _____

A Cheaper
B Costlier
C Time taking
D Low maintenance

1.1i In 1st step of membrane fouling control ___ is passed from the bottom of the tank.

A Chlorine
B Sodium hypochlorite
C Coarse bubbles
D Ozone

1.1j In MBR process, membrane fouling occurs due to

A Coating on the outer layer
B Clogging in the inner layer
C Pressure loss
D All

1.2 Answer the Following. **[05]**

1.2a In microfiltration membrane pore size ranging from ____to ___µm.

1.2b MBR requires low energy cost. (True or False)

1.2c Mention the application of ion exchange.

1.2d 2 RCOOH +_____ $\longrightarrow$ _____ $+ 2H^+$

1.2e Turbidity can be removed by ion exchange process. (True or False)

Q.2 Short Notes (Attempt any two) **[06]**

A Draw flow diagram of ammonia removal by zeolite exchange process.

B What is MBR? Write down its advantages and disadvantages.

C Write down process capabilities of MBR.

Q.3 Explain in detail (Attempt any two) **[14]**

A How to control membrane fouling in MBR process?

B Explain Integrated MBR with immersed membrane with figure.

C Explain ion-exchange process with figure.

Section-II (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a In electro floatation process, the rate of flotation depends on which factor?

- **A** TDS
- **B** pH
- **C** TSS
- **D** COD

1.1b In which of the below condition EC won't work well?

- **A** Higher SS
- **B** TSS>20 mg/L
- **C** Turbidity >25 NTU
- **D** TSS<20 mg/L

1.1c Cathode Passivation in electrocoagulation process can ____ the efficiency of EC process.

- **A** Increases
- **B** Does not affect
- **C** decreases
- **D** None

1.1d Produced water is generated from ____ industry.

- **A** Sugar
- **B** Oil and gas
- **C** Distillery
- **D** Paper

1.1e ___& ____ electrodes are mostly used metals for EC cells

- **A** Iron and Aluminum
- **B** Iron and Copper
- **C** Aluminum and Copper
- **D** Copper and Silver

1.1f Fenton process has to be done at ___pH

- **A** 8-8.5
- **B** 9-9.5
- **C** 4-5
- **D** 3-3.5

1.1g In Fenton process, H2O2 reacts with which ion?

- **A** Nitrate
- **B** Chloride
- **C** Ferrous
- **D** Ferric

1.1h Which of the following are the oxidizing agents in AOP?

- **A** Ozone
- **B** Hydroxyl radicals
- **C** Hypochlorite
- **D** All of the above

1.1i Bubbles of which gas is generated during EC-EF Process?

A Ammonia
B Methane
C Helium
D Hydrogen

1.1j H2O2/UV process in AOP successfully removes ____ compounds from wastewater

A Trichloroethylene
B Perchloroethylene
C N- Nitrosodiumethylamine
D None

1.2 Answer the Following [05]

1.2a Define Refractory organic compounds.
1.2b Full form of AOP.
1.2c Full form of TCE.
1.2d Full form of EC-EF.
1.2e ____ And ____ oxidation can occur in Electrochemical oxidation.

Q.2 Short Notes (Attempt any two) [06]

A Mention advantages and disadvantages of EC.
B Write a note on AOP using Ozone and UV.
C Write a note on AOP using H2O2 and UV.

Q.3 Explain in detail (Attempt any two) [14]

A Write a note on Fenton Process.
B Write a note on Electrocoagulation.
C Write a note on applications of EC.