P. P. SAVANI UNIVERSITY

ThirdSemester of B.Sc. Examination

December-2021

SSES2070–Physico-Chemical Treatment of Wastewater

09.12.2021, Thursday Time: 09:00 a.m. to 11:30 a.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 Which of the following is an example of Physical Characteristics?

- **A** Conductivity
- **B** pH
- **C** Alkalinity
- **D** COD

1.1b TDS is determined at ___ °C

- **A** 105
- **B** 180
- **C** 190
- **D** 150

1.1c Unit of Turbidity is _____

- **A** mg/L
- **B** KL
- **C** NTU
- **D** mg/L as $CaCO_3$

1.1d Which of the following treatment unit is responsible for removal of organic matter present in wastewater?

- **A** Trickling Filter
- **B** Sedimentation Tank
- **C** Grit Chamber
- **D** Filtration

1.1e Find the correct sequence of WTP.

- **A** Coagulation-Flocculation-Filtration-Disinfection
- **B** Flocculation-Coagulation-Filtration-Disinfection
- **C** Coagulation-Flocculation -Disinfection-Filtration
- **D** Flocculation-Coagulation - Disinfection-Filtration

1.1f The head loss in screens is calculated using ___ formula.

- **A** h=0.0724 (V2-v2)
- **B** h=0.0726 (V2-v2)
- **C** h=0.0725 (V2-v2)
- **D** h=0.0729 (V2-v2)

1.1g ____ are provided to remove large obstructions so as to protect pumps and valves.

- **A** Grit chamber
- **B** Screens
- **C** Sedimentation tank
- **D** Filtration

1.1h Grit chamber removes particles with specific gravity ____

- **A** 2.45
- **B** 2.55
- **C** 2.65
- **D** 2.75

1.1i Which of the following is an NOT an example of inorganic coagulant?

- **A** Alum
- **B** FeCl3
- **C** FeSO4
- **D** PAC

1.1j Colloidal particles with diameter 1 micron take ___ time to settle through 1 m of water.

- **A** 1 seconds
- **B** 20 years
- **C** 2 hours
- **D** 8 days

1.2 Answer the Following **[05]**

1.2a Which chemical can be used to neutralize wastewater with acidic pH?

1.2b Volatile Solids can be estimated at ____°C.

1.2c Define Apparent Color.

1.2d Define Head loss.

1.2e Grit chambers are of 3 types. True/False

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

A Write a note on RBC.

B Differentiate between COD and BOD.

C Write a note on Aerated grit chamber

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

A Differentiate between Fine, Medium and coarse screens.

B Draw and explain the treatment scheme of WTP.

C Write a note on types of Flocculators.

Section-II (Total Marks - 30)

Q.1 Short Questions [10]

1.1 Objectives [05]

1.1a Disinfection of water in our country is mainly done by _____.

- **A** Oxygenation
- **B** Hydration
- **C** Chlorination
- **D** Filtration

1.1b Which water treatment process is done after filtration of water?

- **A** Primary sedimentation
- **B** Disinfection
- **C** Secondary sedimentation
- **D** Flocculation

1.1c Which of the following affects the process of sedimentation?

- **A** Particle size
- **B** Water Temperature
- **C** Currents
- **D** All of the above

1.1d Which one of the following filters will produce water of high quality with respect to the bacteriological parameter?

- **A** Slow sand filter
- **B** Rapid sand filter
- **C** Pressure filter
- **D** Dual media filter

1.1e Which of the following is not a method of water treatment for disinfection?

- **A** Chlorine use
- **B** Treatment with additional lime
- **C** Boiling water
- **D** Alcohols

1.1f ____ operates at three-to-four times than the rate of rapid sand filters.

- **A** Slow sand filtration
- **B** High-rate dual media filter
- **C** Pressure sand filter
- **D** Diatomaceous filter

1.1g Which of the following process is used to separate insoluble particles from liquids?

- **A** Filtration
- **B** Extraction
- **C** Drying
- **D** Sieving

1.1h In which type of settling, sedimentation of discrete particles takes place?

- **A** Zone settling
- **B** Compression settling
- **C** Hindered settling
- **D** Discrete settling

1.1i Rapidsandfilterscontain____inchesofsand

A 24-30
B 20-30
C 40-50
D 34-40

1.1j In which type of settling, flocculent suspension of high concentration takes place?

A Type I sedimentation
B Type II sedimentation
C Type III sedimentation
D Type IV sedimentation

1.2 Answer the Following [05]

1.2a Define: Slow sand filter.

1.2b Pressure filters fall into _____ categories.

1.2c Rectangular basins in sedimentation are cost effective.

True
False

1.2d The first zone in sedimentation is _____.

1.2e Explain the term "Discrete particles".

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

A Explain the process of disinfection with ultraviolet radiation.

B Describe the characteristics of ideal disinfection.

C Enlist the various sedimentation zones and explain any one in detail.

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

A Write the factors affection the sedimentation process.

B Discuss the filter clogging problems due to improper back flushing in detail.

C Explain the rapid sand filter with a neat sketch.