

**M. TECH. –III (CHEMICAL ENGINEERING) (CBCS – 2015
COURSE) : WINTER - 2017
SUBJECT: ELECTIVE – I: c) INDUSTRIAL WASTE WATER TREATMENT**

Day: **Tuesday**
Date: **16/01/2018**

Time: **11.00 AM TO 02.00 PM**
Max. Marks: **60**

W-2017-2968

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.

SECTION-I

- Q.1** Discuss the techniques you can employ for waste water reclamation and reuse specially for meeting the needs in the area where fresh water supply is inadequate. **(10)**

OR

- Q.1** What are principle constituents of concern in waste water treatment? Justify with reasons. **(10)**

- Q.2** Determine the clean water head loss in a filter bed of 0.75m of uniform sand for a filtration rate of 160L/m².min. Assume that the operating temperature is 20⁰C. Use the rose equation for computing the head loss. Assume the porosity of the sand in the various layers is 0.40 and use a value of 0.85 for the shape factor for sand. Effective coefficient is given 2.0, effective size – 0.40mm **(10)**

OR

- Q.2** Briefly describe principal mechanism and phenomena contributing to removal of material within a granular medium depth filter. Draw a neat sketch for length of filter runs based on head loss and effluent turbidity. **(10)**

- Q.3** Discuss mode of biomass growth and removal from the reactor in trickling filter operation and explain the oxygen uptake and importance of recycling. **(10)**

OR

- Q.3** Design a flotation thickener without pressurized recycle to thicken the solids in activated sludge mixed liquor for 0.3 to about 4%. Assume that the following conditions apply. **(10)**
A/S ratio – 0.008 mL/ mg
T = 20⁰C
Air solubility = 18.7 mL/ L
Recycle system pressure = 275 kPa
Fraction of saturation = 0.5
Surface loading rate = 8L / m².min
Sludge flow rate = 400m³/d.

P. T. O.

SECTION -II

Q.4 Determine the liquid volume before and after digestion and % reduction for 500kg (dry basis) of primary sludge with the following characteristics. **(10)**

	Primary	Digested
Solids, %	5	10
Volume mater %	60	60
Specific gravity of fixed solids	2.5	2.5
Sp. Gravity of volatile solids	≈ 1.0	≈ 1.0

OR

Q.4 Explain Mesophilic Anaerobic digestion process. **(10)**

Q.5 A brackish water having a TDS concentration of 3000g/m³ is to be desalinated using a thin film composite membrane having a flux rate coefficient k_w of 1.8×10^{-6} m/s. The product water is to have a TDS of no more than 200g/m³. The flow rate is 0.010m³/s , the net operating pressure will be 2500 kPa. Assume the recovery rate will be 90%. Estimate the rejection rate and the concentration of the concentrate stream. **(10)**

OR

Q.5 Explain in detail process for Nitrogen removal. **(10)**

Q.6 a) Give characteristics of solid waste. **(05)**

b) Give different methods of disposal of solid waste. **(05)**

OR

Q.6 Write a detail note on: “Hazardous waste management and Risk assessment”. **(10)**

* * * *