Day : Monday   Time : 10:00 AM-01:00 PM
Date : 30-05-2022   **S-14185-2022**   Max. Marks : 60

N.B. :

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Assume suitable data if necessary.

SECTION - I

Q.1 How would you estimate, physical, chemical and biological polluting strength **(10)** of Industrial waste water.

OR

Q.1 Discuss physical, chemical and biological characteristics of Industrial waste **(10)** water.

Q.2 Using - $A = \dfrac{Q \cdot t_u}{H_u}$, **(10)**

Explain the application of settling curve data for design of Thickner Area.

OR

Q.2 What are filter aids? Explain types of filtration and derive expression for **(10)** design of vacuum drum filter.

Q.3 Explain the principle of Aeration? Draw different types of surface aerators and **(10)** state the difference between submerged aerators surface aeration.

OR

Q.3 "Biological growth of microorganisms depends on initial concentration of **(10)** microorganisms (x_0) and death rate of microorganisms". Derive expression $x = x_o e^{-k.t.}$ and $x_t = x_o e^{-kd.t.}$ and explain Monod growth kinetics.

SECTION - II

Q.4 What is Aerobic digestion? State the advantages and disadvantages of Aerobic **(10)** digestion? Give the reactions involved in Biomass destruction.

OR

Q.4 Describe the average range of parameter for the conventional air aerobic **(10)** digestion tank for 60 days retention time at 20 °C.

Content	Primary	Digested
Solid %	5	10
Volume matter %	60	60
Sp, gravity of fixed solids	2.5	2.5
Sp. Gravity of volatile solids	≈ 1.0	≈ 1.0

P.T.O.

Q.5 Estimate the rejection rate for the concentration of concentrate stream using **(10)** composite membrane for demineralization of brakish water with the following data.

  i)   TDS concentration – 4000 g/m^3
  ii)   Flux rate – $k_w = 2.0 \times 10^{-6}$ s/m
  iii)   Mass transfer rate – $k_l = 1.6 \times 10^{-6}$ m/s
  iv)   Product water TDS = not more than $200 g/m^3$
  v)   Flow rate of water = 0.010 m^3/s
  vi)   Net operating pressure = 3000 k/a
  vii) Assume recovery rate will be 95%

OR

Q.5 Suggest effective and efficient treatment method for the removal of **(10)** phosphorous material from the industrial waste. Support your answer with flow diagram & describe the process of removal with chemical reaction.

Q.6 Explain the methods for the disposal of nuclear solid waste. **(10)**

OR

Q.6 List the chemical sludge which falls under hazardous category? State its **(10)** permissible limits and how would you propose the waste disposal management of Aluminum Industry.

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