BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : VII**
BRANCH: CHEM.ENG. / CHEM & POLY. **SESSION : MO/19**

SUBJECT: CL7031 POLLUTION CONTROL EQU. DESIGN

TIME: 3 HOURS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Explain the working principle of Non-dispersive infrared analyzer with the help of neat schematic diagram? [6]

Q.1(b) Explain the institutional frame work of Central Pollution Control Board established under water act1974? [6]

Q.2(a) Explain about the working principle of electrostatic precipitator with neat sketch? And derive an expression for the collection efficiency of particulate matter in plate and wire ESP? [7]

Q.2(b) An electrostatic precipitator for use with standard air containing dust particles of 1.0 μm diameter is in the form of cylinder of 0.3 m diameter and 2.0 m long. The volumetric flow rate of air is 0.075 m3/s. if the electrical field strength is 100000 V/m and if the particle charge is $0.3x10^{-15}$ coulomb, compute the collection efficiency? [mean free path of the gas molecules λ = 0.066 μm] [5]

Q.3(a) For the reaction ½ N_2 + ½ $O_2 \rightarrow NO$, the equilibrium compositions of NO and O_2 at 4000K and 1 atm. Pressure are 100000 ppm and 150000 ppm respectively. To what N:O ratio this corresponds to? [4]

Q.3(b) What is the value of equilibrium constant? [4]

Q.3(c) If N:O ratio is now changed to 5:1 and the equilibrium concentration of O2 obtained is same as before, what will be the concentration of N:O? [4]

Q.4(a) Define biochemical oxygen demand and chemical oxygen demand? What is the difference between them? [2]

Q.4(b) If L_u is the ultimate BOD, L is the amount of BOD remaining in time t and k_1 is the deoxygenation constant per day, determine the equation for BOD utilization on day 5 (Y_5). And show the relationship between L, L_u and Y_5 on time vs BOD plot? [4]

Q.4(c) The ultimate BOD for some waste is 300 mg/L. For the values of k_1' equals to 0.1, 0.15, 0.2 and 0.3, plot the BOD utilization curve as a function of time. What is the 5 day BOD in each case? [6]

Q.5(a) Write a short notes on the following with neat sketch and differentiate between them? A)Facultative ponds, B)Aerobic Ponds, C)Anaerobic ponds [6]

Q.5(b) Explain the principles of following advanced treatment techniques with neat schematics? A) Microstraining, B)Ion-Exchange, C)Solvent Extraction? [6]

Q.6(a) Briefly discuss about the disposal methods of solid waste? [2]

Q.6(b) Identify the importance of different steps involved in composting practice? [4]

Q.6(c) Explain the significance of various processes involved in composting? [6]

Q.7(a) Categorize the different unit operations operated and classify the different emissions, waste water, solid waste, hazard waste releasing and suggest the prevention and control methods of any of the following industry? Fertilizer, paper and pulp? [12]

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