

JK LAKSHMIPAT UNIVERSITY, JAIPUR
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination December 2018

B. Tech (as applicable) in Chemical and Civil Engineering, Semester Seventh

Roll No.....

COURSE CODE: CHE803

Time: 3 hours

Max. Marks: 80

COURSE TITLE: **Industrial Pollution Abatement**

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate **units, nomenclature, and drawing neat sketches/schematics/ flow chart** wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. The term Municipal Solid Waste (MSW) is generally used to describe:
 - a) Wastes from industrial processes, construction and demolition debris.
 - b) Wastes from Private homes, commercial establishments and institutions.
 - c) Mining wastes
 - d) Agricultural wastes
- ii. Problem of solid waste disposal can be reduced through.....
 - a) Recycling
 - b) Lesser pollution
 - c) More timber
 - d) Population control
- iii. EIA is necessary because?
 - (a) Development is bad for the environment
 - (b) There is growing interest in sustainability
 - (c) Environmental impacts of developments are of public interest
 - (d) None of the above
- iv. Which one of the following gases is not included in the category 'greenhouse gases'?
 - (a) Methane
 - (b) Hydrogen
 - (c) Carbon dioxide
 - (d) Nitrous oxide
- v. Measuring Biochemical Oxygen Demand (BOD) is a method used for
 - (a) Measuring the activity of *Saccharomyces cerevisiae* in producing curd on a commercial scale
 - (b) Working out the efficiency of R.B.Cs. about their capacity to carry oxygen
 - (c) Estimating the amount of organic matter in sewage water
 - (d) Working out the efficiency of oil driven automobile engines
- vi. What are the tolerance limit of cyanides and arsenic for effluents discharged into the surface water?
 - (a) 0.2 mg/l
 - (b) 0.1 mg/l
 - (c) 0.02mg/l
 - (d) 0.05 mg/l

- vii. The tolerance limit is to be found 2 mg/l for effluents discharged in to surface water, which element present in the effluent stream
Sulphides (b) fluorides (c) cadmium (d) all of the above
- viii. The collection of water for bacterial test. The container and bottles must be cleaned with and then should be thoroughly rinsed with distilled water and finally sterilization should be done.
(a) Sulphuric acid (b) potassium dichromate (c) alkaline permanganate (d) all of the above
- ix. The dissolve oxygen concentration falls and rise in the zone of active decomposition
(a) 40 & 0 (b) 100 & 0 (c) 0 & 40 (d) 0 & 100
- x. As per self-purification system the river stream having are five different zones like (i) zone of degradation (ii) zone of clean water (iii) Zone of recovery (iv) zone of cleaner water (v) zone of active decomposition. What are the correct sequence of zone in self-purification system?
i-ii-iii-iv-v (b) ii-i-iii-v-iv (c) ii-i-v-iii-iv (d) i-iii-ii-v-iv

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- Write a note on various physical properties of waste water.
- Differentiate clearly between BOD, COD and TOD
- What are the factors on which K-value depends?
- Write notes on cyclone separators and electrostatic precipitators.

Q.3A What do you understand by unit operations and processes? Elaborate various types of unit operations used for wastewater treatment. 05

Q.3B Give short note on ISO 14001 and discuss its importance for environment management 05

Q.4A Discuss the zeolite method with important chemical reactions for water softening process. 05

Q.4B Change the concentration of organic matter L, with time t, is given by $\frac{dL}{dt} = -KL$ 05
 Calculate the organic matter remaining after 4 days if the initial concentration was 300 mg/l and the rate constant is 0.3 per day.

Q.5A Enumerate various types of methods and equipment used for the control of emissions of air pollutants like particulate and gaseous pollutants. 05

Q.5B Write short note on Global warming and classification of hazardous waste 05

Q.6A A factory uses 1.5 Ml of fuel oil per month. The exhaust gases from the factory contain the following quantities of pollutants per Ml per year: particulate matter is 4 t/year, sulfur dioxide is 20 t/year, NO_x is 5 t/year and HC, CO, and others are 3 t/year. Determine the safe height of the chimney required for the safe dispersion of the pollutants. 05

Q.6B1 Effluent from a wastewater treatment plant is discharged to a surface stream. the characteristics of the effluent and stream are as follows: 05

Streams	Flow rate	BOD ₅ (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Chloride (mg/L)	Temp (°C)
Effluent	8640 m ³ /day	25	7	10	15	25
Stream	1.2 m ³ /sec	2.1	0.1	3.0	5.0	20

Determine the stream characteristics after mixing with waste has occurred.

OR

- Q.6B2 A spherical particle with diameter of 0.5 cm and specific gravity of 2.65 settling through water at 20 °C. Determine the terminal settling velocity of the spherical particle upto forth iteration. The density of the water is 998.2kg/m³ and viscosity is 0.001002 N.s/m² at 20°C 05
- Q.7 A municipal wastewater treatment plant discharge secondary effluents to a surface stream. The worst conditions are known to occur in the summer months when stream flow is low and water temperature is high. Under these conditions, measurements are made in the laboratory and in the field to determine the characteristics of the wastewater and stream flows. The waste water is found to have a maximum flow rate of 15,000 m³/day, a BOD₅ of 40 mg/L, a dissolved oxygen concentration of 2 mg/L, and a temperature of 25°C. the upstream from the point of wastewater discharge is found to have a minimum flow rate of 0.5 m³/sec, a BOD₅ of 3 mg/L, a dissolved oxygen concentration of 8 mg/L, and a temperature of 22°C. Complete mixing of the wastewater and stream is almost instantaneous, and the velocity of the mixture is 0.2 m/s. from the flow regime, the reaeration constant is estimated to be 0.4 per day for 20°C conditions. Determine the deficit at point 20, 75, and 100 km from the point of discharge and also determine critical deficit and its location and Sketch the dissolved oxygen profile a 100-km reach of the stream below the discharge. 10
- Q.8A What do you understand by oxygen-sag curve? Derive the classic Streeter-Phelps oxygen sag equation. 10
- OR
- Q.8B 125 cumecs of sewage of a city discharged in a perennial river which is fully saturated with oxygen and flows at a minimum rate of 1600 cumecs with a minimum velocity of 0.12 m/sec. if the 5-day BOD of sewage is 300mg/L, find out where the critical DO occur in the river. Assume 10
- (i) The coefficient of purification of the river as 4.0.
 - (ii) The coefficient of DO as 0.11, and
 - (iii) The ultimate BOD as 125% of the 5-day BOD of the mixture of sewage and river water.

*****All the Best*****