GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M.Tech. (Second Semester) Regular Examinations, July – 2025

24MCHPE12002 – Waste Water Engineering

(Chemical Engineering)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Categorize the objective of advanced treatment process.	CO2	K1
b. What are different types of hardness?	CO3	K1
c. Suggest about treated water utilization.	CO3	K2
d. Prioritize the materials used for membrane design.	CO4	K1
e. Plot the chlorine demand curve.	CO4	K3

PART – B **(10 x 5=50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Name and explain the essential objectives of sludge stabilization.	5	CO1	K1
b. The digestion process in a digester of a municipal wastewater treatment plant basically runs in four phases. Name the four phases of this conversion in the correct sequence.	5	CO2	K2
(OR)			
c. Digester gas is an essential source of energy in wastewater treatment plants. What possibilities are there for utilizing the digester gas?	4	CO1	K1
d. What type of removal of the sewage sludge to agricultural areas is, in general, the most economic disposal? a) Wet transport after thickening. b) Removal of sludge from the sludge basins. c) Scattering of dried sludge. d) Composting. e) Removal of dewatered sludge from chamber filter presses.	6	CO2	K2
3.a. Enumerate the Toxicity Assessment of Industrial Effluent by Bioassays.	5	CO2	K2
b. Explain the different steps used to control the water pollution in source.	5	CO2	K1
(OR)			
c. What are the various methods employed for the removal of heavy metals from contaminated water or wastewater systems? Discuss each method in detail, highlighting the underlying principles, advantages, limitations.	5	CO2	K2
d. What is the equalization process in wastewater treatment systems, and why is it considered an essential component of effective treatment?.	5	CO3	K3
4.a. What is the advanced treatment process used for waste water treatment?	5	CO3	K2
b. Explain in details about rotating biological contactor.	5	CO4	K3
(OR)			
c. An activated sludge plant of V = 1,350 m3 has the following operating data: Inflow: Q = 75 litres/s BOD5 influent: (BOD5) = 200 mg/litre Mixed liquor	6	CO3	K1

suspended solids in the aeration tank: MLSSAT = 3.3 g/litre Specific excess sludge production: ESA = 0.8 kg DS/kg BOD5 Recirculation ratio: RR = 1.1 Determine:

a) The sludge loading.

b) The daily quantity of excess sludge QES (m3/d) produced daily.

c) How many inhabitants (I) per m3 tank volume are treated if the specific influent load to the activated sludge plant is 40 g BOD5/(I x d)?

d.	A sufficient supply of oxygen for the bacteria is the essential task of the aeration in aeration tanks. a) Which factors have an influence on a modification of the oxygen demand in aeration tanks? Justify your answer	4	CO4	K2
5.a.	What do you understand by thickening (or) concentration of sludge? List the various methods of sludge thickening. Describe with the help of neat sketch gravity-sludge thickener?	5	CO2	K1
b.	Nitrogen removal takes place in wastewater treatment plants through the biological-chemical processes of nitrification and denitrification. Describe both processes briefly.	5	CO3	K2
	(OR)			
c.	Name the essential objectives of sludge stabilisation.	4	CO2	K1
d.	The digestion process in a digester of a municipal wastewater treatment plant basically runs in four phases. Name the four phases of this conversion in the correct sequence.	6	CO4	K3
6.a.	Give the different possibilities of sewage sludge utilisation and the benefits to be achieved with this.	4	CO4	K1
b.	Explain the methods of sewage sludge disposal with reference to their use in agriculture and incineration. Discuss in detail the advantages and disadvantages of: a) Utilization of sewage sludge in agriculture b) Incineration of sewage sludge Support your answer with technical and environmental considerations.	6	CO2	K2
	(OR)			
c.	Discuss the various methods available for the disposal of sewage sludge in agricultural areas. Which method is generally considered the most economical, and why? Support your answer with technical reasoning.	4	CO3	K1
d.	A wastewater treatment plant has a capacity of 5,000 PT with a wet sludge yield of 0.5 m3 per PT and year (ρ = 1.05 kg/dm3). The dry solid matter content is 4 %. Calculate the minimum surface area requirement in ha for an agricultural utilisation if, according to the Sewage Sludge Ordinance, a maximum of 5 t within 3 years may be applied.	6	CO4	K2

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