KUMARAGURU college of technology
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Register Number:……

M.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

ENVIRONMENTAL ENGINEERING

P18EEE0006**:** Industrial Wastewater Treatment

COURSE OUTCOMES

CO1: Identify the environmental standards and the industrial waste stream characteristics from several major industrial categories.

CO2: Develop an overall treatment strategy for an industrial waste stream.

CO3: Specify design criteria for physical, chemical and biological unit operations and processes.

CO4: Estimate capital and operating cost for industrial waste treatment systems.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which of the following is an example of a non-point source of pollution? CO1 [K_1]

   a) Industrial effluent discharge
   b) Municipal sewage discharge from partially operated sewage treatment plant
   c) Sediment runoff
   d) All of the above

2. Which of the following statements is true about pollutants and contaminants? CO1 [K_1]

   a) Both pollutant and contaminant always have harmful effects on the surroundings.
   b) A pollutant always has harmful effects on the surroundings while a contaminant may or may not have the same
   c) A pollutant may be a component of the system while a contaminant is usually introduced from the outside.
   d) Both b and c

3. Which of the following relation is correct about BOD? CO2 [K_1]

   a) BOD5 < BODu < BOD3
   b) BOD3 < BOD5 < BODu
   c) BOD5 < BOD3 < BODu
   d) BOD3 < BODu < BOD5

4. Match the instruments / methods to respective water quality parameters in the following lists: CO2 [K_1]

Instrument / Methods	Water Quality Parameter
A. Nephelometer	i. Dissolved Oxygen
B. Winkler Method	ii. Pathogens
C. MPN test	iii. Metals
D. Atomic Adsorption Spectra	iv. Turbidity

a) A-i, B-iv, C-iii, D-ii
b) A-iii, B-ii, C-iv, D-i
c) A-iv, B-i, C-ii, D-iii
d) A-ii, B-iii, C-i, D-iv

5. The amount of oxygen required by nitrifiers for nitrification in wastewaters is represented by CO3 [K_1]

a) COD
b) CBOD
c) NBOD
d) BOD_5

6. The correct sequence in anaerobic treatment process is: CO3 [K_1]

a) Acidogenesis→Acetogenesis→Methanogenesis→Hydrolysis
b) Hydrolysis→Acidogenesis→Acetogenesis→Methanogenesis
c) Hydrolysis→Acetogenesi→Acidogenesi→Methanogenesis
d) Acetogenesis→Acidogenesis→Methanogenesis→Hydrolysis

7. Assertion (A): The activated sludge process offers secondary treatment with minimum area requirement, and effluent quality is one of the disadvantages. CO3 [K_1]
Reason (R): The advantages of activated sludge plants are that they are easy to operate and do not require supervision.

a) Both are correct
b) Both are incorrect
c) Statement 1 is correct and statement 2 is incorrect
d) Statement 1 is incorrect and statement 2 is correct

8. Issues with untreated wastewater disposal include CO4 [K_1]

a) It pollutes the receiving water body
b) Reduces usable water availability
c) Enhances human health risk for population exposed to the receiving water body
d) All of the above

9. Which of the following determines the settling characteristics of sludge? CO4 [K_1]

a) Sludge Volume Index (SVI)
b) Solid Retention Time (SRT)
c) Food to microorganism (F/M) ratio
d) Organic Loading Rate (OLR)

10. For a river receiving wastewater stream, the DO levels drops to minimum in: CO4 [K_1]

a) Clean zone b) Decomposition zone

c) Septic zone d) Recovery zone

PART B (10 x 2 = 20 Marks)

11. List out any five characteristics of industrial waste water with its permissible limits. CO1 [K_1]
12. Recall any four purposes of wastewater monitoring. CO1 [K_1]
13. Name the components of waste management hierarchy. CO2 [K_1]
14. Define the term pay-back period. State its uses. CO2 [K_1]
15. Mention the uses of ion exchange process in industrial waste water treatment. CO3 [K_2]
16. Why should phosphorus be removed from waste water? CO3 [K_1]
17. Recollect the characteristics of RO reject. CO4 [K_1]
18. What do you mean by the term Sludge thickening? CO4 [K_1]
19. Give an outline on the principle of source reduction. CO4 [K_1]
20. Indicate the characteristics of effluent from an oil refinery. CO4 [K_1]

PART C (6 x 5 = 30 Marks)

21. Brief about the environmental impacts of industrial wastewater. CO1 [K_2]

22. Explain the cost benefit analysis in the waste water treatment. CO2 [K_2]

23. Illustrate the mechanism involved in the removal of nitrogen from the industrial waste water. CO3 [K_2]

24. Describe the techniques involved in the disposal of residues generated from waste water treatment plant. CO4 [K_2]

25. Give a brief note on sources of wastewater from sugar industry. CO4 [K_2]

26. Summarize the effects of waste water from textile industry on receiving streams. CO4 [K_2]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27.	Explain the salient features of the Water (Prevention & Control of Pollution) Act, 1974.	CO1	[K_2]
28.	Discuss the principle, applications and limitations of biological wastewater treatment processes.	CO3	[K_2]
29.	Describe the concept, principle, advantages and limitations of zero effluent discharge systems in industries.	CO4	[K_2]
30.	Taking the case of paper and pulp industry, explain the treatment techniques that are involved in recycle and remediation of effluent from the industry.	CO4	[K_2]
31.	With the neat process flow sheet, highlight the origin and characterization of wastewater generated in typical tannery industry.	CO4	[K_2]

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