



M.E / M.TECH DEGREE EXAMINATIONS: NOV/ DEC 2024

(Regulation 2024)

First Semester

ENVIRONMENTAL ENGINEERING

24ENT503: Design of Water and Wastewater Treatment Systems

COURSE OUTCOMES

- CO1:** Categorize the flow characteristics of water and wastewater and their hydraulic profiles
- CO2:** Apply the appropriate water and wastewater treatment process units based on their working principles and mechanisms
- CO3:** Design of aerobic, anaerobic and other advanced wastewater treatment processes under suitable kinetic conditions
- CO4:** Design of low-cost natural water treatment and sludge disposal methods

Time: Three Hours

Maximum Marks: 100

PART A (4*20 = 80 Marks)

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| 1. | a) | Explain the various physical, chemical and biological characteristics of wastewater. | 10 | CO1 | [K ₂] |
| | b) | Classify the types of reactors in wastewater treatment. | 10 | CO1 | [K ₂] |
| 2. | a) | Distinguish between ultrafiltration and nanofiltration. | 4 | CO2 | [K ₄] |
| | b) | Analyze the various methods of removing excess iron and manganese from ground water. | 8 | CO2 | [K ₄] |
| | c) | Categorize the different methods of disinfecting water. | 8 | CO2 | [K ₄] |
| 3. | a) | Illustrate the role of microorganisms and the growth kinetics in biological treatment of wastewater. | 10 | CO3 | [K ₂] |
| | b) | Interpret the microbiology involved in biological process of phosphorous removal. | 10 | CO3 | [K ₂] |
| 4. | a) | Identify the need for sludge dewatering and also the suitable dewatering methods. | 10 | CO3 | [K ₃] |
| | b) | Outline the anaerobic sludge digestion process applying the effects of pH and temperature on it. | 10 | CO4 | [K ₃] |

Answer any ONE Question
PART B (1*20 = 20 Marks)

5. a) A single stage filter is to treat a flow of 3.79 Mld of raw sewage with BOD of 240 mg/l. It is to be designed for a loading of 11086 kg of BOD in raw sewage per hectare meter, and the recirculation ratio is to be unity. Compare the strength of the effluent with the standard recommendation. 10 CO3 [K₄]
- b) With a neat flow diagram explain activated sludge process in treating wastewater and relate the various parameters involved in it. 10 CO2 [K₄]

OR

6. a) Design an oxidation pond for treating sewage from a hot climatic residential colony with 5000 persons, contributing sewage at 120 liters per capital per day. The 5-day BOD of sewage is 300mg/l. 10 CO3 [K₄]
- b) Analyze the component parts, operation advantages and disadvantages of any Natural, wastewater treatment systems. 10 CO2 [K₄]
