| Reg. No. | | | | | | | | | | | | | | | | |
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| Question Paper Code | 13176 |
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024**

Seventh Semester

**Civil Engineering**

**20CEEL701 - INDUSTRIAL WASTEWATER TREATMENT**

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

| | | Marks | K – Level | CO |
|---|---|---|---|---|
| 1. | _____indicates chemical characteristics of industrial wastewater.<br>(a) Colour (b) BOD and COD (c) Temperature (d) Taste | 1 | K1 | CO1 |
| 2. | The bioassay test on industrial pollutants is performed to evaluate<br>(a) No emission (b) Zero discharge (c) High discharge (d) Medium discharge | 1 | K2 | CO1 |
| 3. | The ultimate goal of waste minimization should be<br>(a) Toxicity (b) Ignitability (c) Chlorine content (d) pH | 1 | K1 | CO1 |
| 4. | Graphical method is useful to determine _____ of Equalization tank.<br>(a) Aeration (b) Volume (c) Strength (d) Volume and Strength | 1 | K1 | CO2 |
| 5. | The environmental issue caused by chemical precipitation is<br>(a) Degradation (b) Liquid matter (c) Increase in DO (d) Generation of toxic sludge | 1 | K1 | CO2 |
| 6. | _____ is membrane technology filtration method that removes many types of large molecules and ions from solution by applying pressure to solution.<br>(a) Reverse osmosis (b) Distillation (c) Disinfection (d) Freezing | 1 | K1 | CO2 |
| 7. | Which type of membrane is used for the RO process?<br>(a) Highly permeable (b) Permeable (c) Semi-permeable (d) Non-permeable | 1 | K2 | CO3 |
| 8. | Which of the following treatment processes is essential for ensuring safe reuse of industrial wastewater?<br>(a) Sedimentation (b) Advanced oxidation processes<br>(c) Screening (d) Chlorination | 1 | K1 | CO3 |
| 9. | Which of the following industries is most likely to adopt a zero effluent discharge system due to high water consumption and waste generation?<br>(a) Textile industry (b) Software industry (c) Education sector (d) Electronics sector | 1 | K1 | CO3 |
| 10. | Which of the following is the most common type of residual generated in industrial wastewater treatment?<br>(a) Solid sludge (b) Dissolved gases (c) Ash (d) Grit | 1 | K1 | CO4 |
| 11. | Which of the following is a common characteristic of hazardous waste?<br>(a) Biodegradability (b) Flammability (c) Low toxicity (d) Neutral pH | 1 | K1 | CO4 |
| 12. | Which of the following methods is commonly used for sludge dewatering?<br>(a) Filtration (b) Evaporation (c) Oxidation (d) Adsorption | 1 | K1 | CO4 |
| 13. | What parameter is used to assess the acidity or alkalinity of wastewater?<br>(a) Total suspended solids (b) Electrical conductivity (c) pH (d) COD | 1 | K1 | CO5 |
| 14. | What does the term Biochemical Oxygen Demand (BOD) measure in wastewater<br>(a) Amount of organic matter (b) Concentration of heavy metals<br>(c) Temperature of the wastewater (d) Total suspended solids | 1 | K2 | CO5 |
| 15. | Which of the following management is a common tool used for identifying pollution prevention opportunities?<br>(a) Life cycle assessment (b) Total quality (c) Six sigma (d) Supply chain | 1 | K1 | CO5 |
| 16. | Which strategy is used to reduce emissions in manufacturing processes?<br>(a) Equipment maintenance (b) Process modification (c) Waste disposal (d) Material use | 1 | K1 | CO5 |

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| 17. | During pulp manufacturing black liquor is generated from _____process.<br>(a) Chipping (b) Bleaching (c) Soaking (d) Digestion | 1 | K1 | CO6 |
| 18. | Spent wash is wastewater from _____industry.<br>(a) Dairy (b) Sugar (c) Distellery (d) Tannery | 1 | K1 | CO6 |
| 19. | _____is one of the byproduct from sugar industry<br>(a) Bagasse (b)Yeast sludge (c) Spent wash (d) Whey | 1 | K1 | CO6 |
| 20. | What treatment method is often used to remove heavy metals from metal finishing wastewater?<br>(a) Activated sludge (b) Chemical precipitation<br>(c) Membrane filtration (d) Aerobic digestion | 1 | K1 | CO6 |

**PART - B (10 × 2 = 20 Marks)**

Answer ALL Questions

| | | | | |
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| 21. | Which is better-prevention of generation of wastewater? Why? | 2 | K1 | CO1 |
| 22. | What are the barriers of pollution prevention? | 2 | K1 | CO1 |
| 23. | State the necessity of flotation in industrial waste water. | 2 | K1 | CO2 |
| 24. | Classify the types of photo catalysts are commonly used in the treatment of industrial wastewater. | 2 | K2 | CO2 |
| 25. | Outline the primary goals of implementing a zero effluent discharge systems in an industrial setting. | 2 | K2 | CO3 |
| 26. | Enlist the common applications of reused wastewater in industries. | 2 | K1 | CO3 |
| 27. | What is sludge conditioning? | 2 | K1 | CO4 |
| 28. | Mention the purpose of a gas collection system in secured landfills. | 2 | K2 | CO4 |
| 29. | How can reduce water at source in tannery industry? | 2 | K1 | CO5 |
| 30. | Illustrate the characteristics of distillery waste water. | 2 | K2 | CO6 |

**PART - C (6 × 10 = 60 Marks)**

Answer ALL Questions

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| 31. | a) i) | Predict the various uses of water in chemical industry. | 4 | K2 | CO1 |
| | ii) | Summarize the regulatory requirements for treatment of industrial waste water. | 6 | K2 | CO1 |
| | | **OR** | | | |
| | b) | How is pollution prevention options evaluated? Explain the cost benefit analysis in detail. | 10 | K2 | CO1 |
| 32. | a) i) | Outline the objectives of neutralization with suitable examples. | 4 | K3 | CO2 |
| | ii) | Categorize the various methods of anaerobic biological treatment process of industrial waste water. | 6 | K3 | CO2 |
| | | **OR** | | | |
| | b) | Enumerate the advanced oxidation process techniques for the treatment of wastewater. | 10 | K3 | CO2 |
| 33. | a) | Illustrate about the effluent treatment plants. Why is the pollution control board taking stringent actions in the maintenance of effluent treatment plant? | 10 | K3 | CO3 |
| | | **OR** | | | |
| | b) i) | How the RO rejects are managed? Explain. | 5 | K2 | CO3 |
| | ii) | Outline the common methods of industrial wastewater disposal on water bodies. | 5 | K2 | CO3 |
| 34. | a) | Describe the various characteristics of sludge thickening process with neat sketch. | 10 | K2 | CO4 |
| | | **OR** | | | |

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| | b) | Differentiate between solidification and incineration. In what situations would solidification be preferred over incineration for hazardous waste management? | *10* | *K3* | *CO4* |
| 35. | a) | Describe the different types of industrial manufacturing processes with suitable illustration. | *10* | *K2* | *CO5* |
| | | **OR** | | | |
| | b) | Discuss the principles of pollution prevention options and its significance in environmental management. | *10* | *K2* | *CO5* |
| 36. | a) | Explain the manufacturing process and treatment methods of textile industry with neat sketch. | *10* | *K3* | *CO6* |
| | | **OR** | | | |
| | b) | With a flow diagram, explain the processes in a sugar mill. Also discuss the treatment methods to be adopted. | *10* | *K3* | *CO6* |