

B.E. Eighth Semester (Civil Engineering) (C.B.S.)
Elective - III : Water & Waste Water Treatment

P. Pages : 2

Time : Three Hours



NKT/KS/17/7545

Max. Marks : 80

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- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Diagrams and chemical equations should be given whenever necessary.
 11. Illustrate your answers whenever necessary with the help of neat sketches.
 12. Use of non programmable calculator is permitted.

1. a) Explain the factor to be considered while selecting the site for water treatment plant? 6
- b) Draw a flowsheet of conventional water treatment plant? Explain working of each unit in brief. 7

OR

2. a) Write a short note on gas transfer in aeration process. 6
- b) Design cascade aerator for the design flow of 18 MLD. 7
3. a) Write down factor affecting coagulation & flocculation. 6
- b) Design a flash mixer for $750\text{m}^3/\text{hr}$. 7

OR

4. a) State type of coagulates used in water treatment plant & explain any two. 6
- b) Design a ClarriFlocculator for design flow of $450\text{m}^3/\text{hr}$. 7
5. Design a Rapid Sand Filter for Design Flow of 10 MLD with under drainage system. 14

OR

6. a) What are the objective of filtration & Discuss the various factor affecting the filtration. 7
- b) State the difference between slow sand filter & Rapid Sand Filter. 7

7. a) Draw Flowsheet of conventional waste water treatment plant. Explain working of each unit in brief. 7
- b) Write down characteristics of waste water. 6

OR

8. a) Write short note on the Sewage sickness & Sewage Farming. 7
- b) Explain in detail self purification of stream? 6
9. a) Design a Grit Chamber Flow of $0.4 \text{ m}^3/\text{sec}$. Assume the peak flow rate to be 3 times average flow. 7
- b) Explain various types of screen used in waste water treatment plant. 7

OR

10. a) Design a circular sedimentation Tank for Town having population of 70,000. The average water Demand is 160 lpcd. Assume 75% water reaches at treatment unit & max demand is 2.7 times average demand. 7
- b) Enlist & explain in brief factor affecting anaerobic digestion. 7
11. a) Design the activated Sludge Treatment Unit with following data for town having population of 65,000. 7
- i) Average Sewage Flow = 200 lit/cap/day.
 - ii) B.O.D. of Raw Sewage = 180 mg/lit.
 - iii) Suspended solid in raw sewage = 320 mg/lit.
 - iv) BOD Removed in Primary Treatment = 35%
 - v) Overall BOD Removal desired = 92%
- b) Explain working of UASB with neat sketch. 6

OR

12. a) Explain 'Activated Sludge Process' in detail with neat sketch. 7
- b) Write short notes on **any two**. 6
- i) BOD/COD Ratio
 - ii) MLSS & MLVSS
 - iii) Oxidation Pond
 - iv) Soak pit.

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NRJ/KW/17/4683

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 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

- | | | |
|-----------|---|-----------|
| 1. | a) Draw a layout of conventional water Treatment plant and explain the significance of each unit. | 6 |
| | b) Design cascade aerator for a water treatment plant of a town having population 1.5 lakh and per capita demand of water 180 ℓ Pcd. | 8 |
| OR | | |
| 2. | a) Explain site selection for water treatment plant. | 6 |
| | b) Explain two film theory of gas transfer. | 6 |
| | c) Enlist the types of aerator. | 2 |
| 3. | a) Design a flash mixer for a design flow of 250m ³ /day. | 7 |
| | b) Explain factors affecting coagulation and flocculation. | 6 |
| OR | | |
| 4. | a) Design a clariflocculator for a design flow of 15 MLD. | 13 |
| 5. | a) Distinguish between slow sand filter and Rapid sand filter. | 6 |
| | b) Design a rapid sand filter for 25 MLD. | 8 |
| OR | | |
| 6. | a) Explain in detail disinfection action of chlorine. | 7 |

- b) Results of chlorine demand test on a raw water are given below. Determine the break point dosage and the chlorine demand. 7

Sample No.	Chlorine dosage (mg/lit)	Residual Chlorine after 10 min. contact (mg/lit)
1	0.2	0.18
2	0.4	0.34
3	0.6	0.48
4	0.8	0.46
5	0.9	0.27
6	1.0	0.18
7	1.2	0.38
8	1.4	0.58
9	1.6	0.78

7. a) Find BOD rate constant and ultimate first stage BOD using 'Least Square Method' for following data. 7

Time in days	2	4	6	8	10	12
BOD (mg/lit)	11	18	22	24	26	27

- b) What is BOD? Draw BOD curve and explain various stages of BOD. Also state the significance of BOD. 6

OR

8. a) What is "Oxygen Sag Curve" in stream pollution. Explain with sketch. 7

- b) Explain physical and Chemical characteristics of wastewater. 6

9. a) Design a suitable grit chamber for the design flow of 10 MLD. 7

- b) Explain in brief conventional waste water treatment plant with neat sketch. 6

OR

10. a) Design a suitable screen unit for the design flow of 12 MLD. 7

- b) Explain working of FPST with neat sketch. 6

11. a) What is activated sludge process? With the help of neat sketch explain its working. 6

- b) Explain the factors affecting anaerobic digestion. 4

- c) Explain in brief stabilization ponds. 3

OR

12. Write notes on **any three**. 13

- | | |
|-----------------------|------------------------|
| 1) Sludge digester. | 2) Trickling filter |
| 3) Aerated lagoons | 4) Sludge volume index |
| 5) Sludge drying Beds | |

B.E. Eighth Semester (Civil Engineering) (C.B.S.)
Elective - III : Water & Waste Water Treatment Paper - I

P. Pages : 3

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KNT/KW/16/7545

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 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Diagrams and chemical equations should be given whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the factors to be considered while selecting the site for water treat plant. **6**
b) Draw a flow diagram of conventional water treatment plant and explain the function of each unit in brief. **7**

OR

2. a) Write short note on gas transfer in aeration process. **6**
b) Design the cascade type aerator for the design flow of 15 MLD. **7**
3. a) Write down the factors affecting coagulation and flocculation. **6**
b) Design a clariflocculater for design flow of 500 m³/hr. Assume suitable data. **7**

OR

4. a) State the types of coagulants used in water treatment and explain any one. **6**
b) Design a flash mixer for design flow of 10 MLD. **7**
5. Design completely the rapid sand filter for following data. **13**
 - 1) Population to be served = 75,000 persons.
 - 2) Quantity of water to be supplied = 150 LPCD.
 - 3) Rate of filtration = 4500 Lit/hr/m².
 - 4) Filter water required for back washing = 3%.

OR

6. a) State the difference between slow sand and rapid sand filter. **6**

- b) Result of chlorine demand test on raw water as given below.

7

Sample No.	Chlorine dose (mg/lit)	Residual chlorine after 10 min. contact (mg/lit)
01	0.2	0.19
02	0.4	0.36
03	0.6	0.50
04	0.8	0.48
05	1.0	0.20
06	1.2	0.40
07	1.4	0.60
08	1.6	0.80

Sketch chlorine demand curve. What is break point dose and what is the chlorine demand at dose of 1.2 mg/lit?

7. a) Write down the characteristics of wastewater. 6
- b) The following observations were made on a 3% dilution of waste water for measuring BOD. 8
- i) Dissolved Oxygen (D.O.) at aerated water used for dilution = 3.0 mg/lit.
- ii) Dissolved Oxygen (D.O.) of diluted sample after 05 days incubation = 0.8 mg/lit.
- iii) Dissolved Oxygen (D.O.) of original sample = 0.6 mg/lit.

Calculate the BOD of 5 days & ultimate BOD of the sample assuming that the deoxygenation constant 0.1.

OR

8. a) Write a short note on the broad irrigation & sewage farming. 7
- b) What is 'oxygen sag curve' in stream pollution. Explain with sketch. 7
9. a) Draw the conventional flow diagram of waste water treatment plant and explain the function of each unit in brief. 7
- b) Design the grit chamber for design flow of 15 MLD. Average temperature of sewage is 20°C. Specific gravity of grit particle is 2.65 and diameter of grit particle to be removed is 0.2 mm. 7

OR

10. a) Explain the various types of screens used in waste water treatment plant. 7

- b) Design bar screen channel for the peak flow of 40 MLD. Also calculate the length of channel. 7
Data given.
- 1) Size of bar = 15 mm x 50 mm.
 - 2) Clear spacing between bar = 30 mm.
 - 3) Angle of inclination of screen = 45°.
 - 4) Diameter of incoming sewer = 0.65 m.

11. a) Design the activated sludge treatment unit with the following data, for a town of population 70,000. 7
- 1) Average sewage flow = 210 lit/cap/day.
 - 2) BOD of raw sewage = 200 mg/lit.
 - 3) Suspended solids in raw sewage = 300 mg/lit.
 - 4) BOD removed in primary treatment = 40%.
 - 5) Overall BOD removal desired = 90%.
- b) Explain working of sludge drying beds with neat sketch. 6

OR

12. a) Write down the factors affecting anaerobic digestion tank. 6
- b) Write notes on **any two**. 7
- 1) Trickling filter.
 - 2) Sludge digester.
 - 3) MLSS & MLVSS.
 - 4) BOD/COD ratio.

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