

B.E.Sixth Semester (Civil Engineering) (C.B.S.)  
**Environmental Engineering - II**

P. Pages : 2

Time : Three Hours



**NKT/KS/17/7378**

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) Define sewage, sewer & sewerage system. Explain data required in the planning of sewerage system. 7

b) Describe conservancy & water carriage system with their merits and demerits. 7

**OR**

2. a) Discuss the relative merits & demerits of separate, combined & partially separate system of sewerage. 7

b) Design a main sewer line for a colony of population 20,000. The per capita demand of water supply is 135 LPCD. The sewer line is to be laid at a slope of 1/600. Use manning's coeff. 'n'=0.012. 7

The design discharge is 1.5 times. The avg discharge & the sewer is to be design as a half full section.

3. a) State various types of traps used in house drainage. 7

b) Write short notes on ventilation of sewer. 6

**OR**

4. a) Explain the various system of house plumbing with the help of neat sketch. 7

b) Enlist the sewer appurtenance. Explain manhole. 6

5. a) 5 Day BOD at 20°C of a waste water sample is 240 mg/lit. Determine 4 days BOD at 30°C. Assume deoxygenation constant at 20°C  $K_{20} = 0.1$  day. 6

b) Design a primary sedimentation tank for a max flow of 10 MLD. Assume suitable data. 7

**OR**

6. a) Draw a flow sheet of sewage treatment plant & briefly explain it's units. 7  
b) What are the points that are kept in mind while making a site selection of STP. 6
7. a) Explain the working of trickling filter with neat sketch. 7  
b) What do you understand by self purification capacity of a stream. Explain the process involved in this. 7

**OR**

8. a) Explain in details activated sludge process. 7  
b) What are the different methods of disposal of sewage. Discuss sewage farming. 7
9. a) What are the different types of privies ? Explain with neat sketch Aqua Privy. 7  
b) Explain the terms : 6  
i) Equalization ii) Neutralization.

**OR**

10. a) Design a septic tank for a small colony of 200 person. Rate of water supply is 135 lpcd. Assume suitable data. 7  
b) Explain with the help of neat sketch the working of "Gobar Gas Plant". 6
11. a) Define air pollution & explain various sources of air pollutants. 6  
b) Which equipment are used for controlling particulate emission ? Explain any one with neat sketch. 7

**OR**

12. a) Discuss the effect of air pollution on human health. 6  
b) What are the metrological parameter influencing the air pollution. 7

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1. a) What is conservancy system of sewage disposal? Why it is necessary to replace conservancy system with water carriage system. **6**
- b) A city with population 50,000 residing in area of 50 Acres. A sewer line is to be designed as a combined sewer section if: **7**
- 1) Rate of water supply = 200 lpcd
  - 2) Time of concentration = 50 minutes
  - 3) The surface Area has following run off coefficients:

% Surface Area	Surface	Runoff coefficient
50%	Hard parament	0.85
20%	Unpared street	0.30
20%	Gardens	0.15
10%	Wooded Area	0.10

Assume the design flow equivalent to wet weather flow plus 1.8 Times the dry weather flow. Assume any other data.

**OR**

2. a) Explain the importance of following in design of sewers. **6**
- i) Self cleansing velocity
  - ii) Non scouring velocity
- b) Calculate the velocity of flow, discharge in a sewer with diameter 1m and slope 1 in 500. The sewer runs at 0.6m depth,  $N = 0.012$ . **7**
3. a) Discuss the various stages followed in the construction of sewers. **6**
- b) With a neat diagram explain components of manhole. Explain classification of manhole. **7**

**OR**

4. a) Explain with diagram street inlets. 6  
 b) With neat sketch explain inverted Siphons. 7
5. a) Draw a layout of conventional sewage treatment plant and state function of each unit. 7  
 b) The 5 days BOD at 20°C of a waste water sample is 800 mg/lit. Determine it's ultimate BOD. Assume  $KD = 0.23$  /day with base e. Also find out 4 days BOD at 30°C 7

**OR**

6. a) Discuss the physical & chemical characteristics of waste water. 7  
 b) Design of grit chamber for a flow of 10 MLD. 7
7. a) What do you understand by Activated sludge? Explain with a flow diagram the secondary treatment of sewage using Activated sludge process. 7  
 b) With sketch explain the process of sludge digestion. 7

**OR**

8. a) With neat diagram explain working of 'Trickling filter'. 7  
 b) Explain the stages of oxygen consumption when a waste water is discharged in River giving the various pollution zones with neat diagram. 7
9. a) With neat sketch explain 'Aqua Privy'. 6  
 b) For a colony of 150 person design a septic tank Assuming rate of water supply as 150 lpcd, desludging period as 1 year and percolation rate as 1000 lit/day /m<sup>3</sup>. 7

**OR**

10. a) In what way the approach for design of treatment varies in case of industrial waste water treatment compared to domestic sewage. 6  
 b) Explain the terms:  
 1) Equalization 2) Neutralization 7
11. a) Give classification of different air pollutants along with their source of generation. 6  
 b) Discuss the various meteorological parameters influencing air quality and pollutant dispersion. 7

**OR**

- 12 a) Write a note on impact of Air pollutant on human beings. 6  
 b) With neat sketch explain working of any one particulate control mechanism. 7

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1. a) What are the patterns of sewage collection system? Explain with sketches. 7
- b) Design a circular combined sewer for the following data. 7
- 1) Area to be served : 250 hectare
  - 2) Population density : 1200/hectare
  - 3) Rate of water supply : 135 lpcd
  - 4) Time of concentration : 50 minutes
  - 5) Maximum velocity in sewer : 1.6 m/s
  - 6) Mannings constant : 0.012
  - 7) Surface area has following runoff coefficient

% Surface Area	Surface	Runoff coefficient
40	Hard surface	0.85
25	Gardens & lawns	0.15
15	Unpaved street	0.3
20	Roof surface	0.8

Assume Design discharge = DWF + 2(WWF)

**OR**

2. a) What is "Time of concentration"? What is its significance in determining storm water flow. 7
- b) Calculate the self cleansing velocity and gradient required to transport coarse sand through a sewer of diameter 60 cm with sand particles of diameter 1 mm and specific gravity 2.66,  $\beta = 0.06$  and  $f = 0.02$ . Assume sewer running half full. 7
3. a) Explain the purpose of providing a manhole. With a neat diagram explain the components of drop manhole. 6
- b) Describe various stages followed in construction of sewers. 7

**OR**

4. a) With neat diagram explain street inlets. 6  
b) Write a note on ventilation of sewers. 7
5. a) Explain why it is necessary to do characterisation of wastewater? Give a list of various physical and chemical characteristics of wastewater. 6  
b) Explain the meaning of following terms & their significance 7  
i) BOD ii) COD  
iii) BOD/COD ratio

**OR**

6. a) A grit chamber is to be designed for a flow of 12 MLD. The chamber is designed to remove particles of 0.2 mm diameter and specific gravity 2.65. 6  
b) Draw a layout of conventional sewage treatment plant and explain function of each unit. 7
7. a) What are the principles of biological treatment of wastewater? Explain types of biological treatment processes. 7  
b) With neat sketch explain working of activated sludge process. 7

**OR**

8. a) Write a note on Sewage farming. 7  
b) Explain the various zones in a polluted stream under going self purification. 7
9. a) A septic tank with a soak pit is to be designed for 150 persons receiving water supply of 135 lpcd. Assume desludging period of 1 year and soak well percolation rate of 1250 lit/m<sup>3</sup>/d. 6  
b) What are the methods of disposal of septic tank effluents and explain it in brief. 7

**OR**

10. a) What are the different privies used in conservancy system of sanitation. With sketch draw any one type of privy. 6  
b) Discuss application of Biological treatment for industrial wastewater treatment. 7
11. a) Define air pollution? What are the different types of air pollutants classify them? 6  
b) Explain impact of air pollution on plants and material. 7

**OR**

12. a) What are the various meteorological parameters influencing air quality. 6  
b) List the various equipments for controlling particulate matter: With neat sketch explain any one of them. 7

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1. a) Describe in brief the methods of collection for various types of waste in the conservancy system. 6
- b) The following data is available regarding various types of area and the corresponding impermeability factors of a town. 7

Type	% Area	Impermeability coefficient
1) Roof	15%	0.9
2) Pavement	20%	0.8
3) Lawn, garden, vegetation	40%	0.15
4) Unpaved	15%	0.20
5) Wooded	10%	0.05

If the total area of the district is 20 hectares, determine the maximum storm water flow for a rainfall intensity of 50 mm/hr having a frequency of once in five years. Use Rational formula.

**OR**

2. a) Write notes on **any two**. 6
  - i) Self - cleansing velocity
  - ii) Non - scouring velocity
  - iii) Hydraulic Equivalent section
  - iv) Circular and Egg shaped sewer section
- b) A main combined sewer is to be designed to serve an area of 12 sq.km with a population density of 250 person/ hectare. The average rate of sewage flow is 250 litres/capita / day. The maximum flow is 100% in excess of average together with the rainfall equivalent of 15 mm in 24 hours, all of which are runoff. Determine the capacity of the sewer. Taking the maximum velocity of flow as 3m/sec. Determine the size of the circular sewer. 7
3. a) Write a note on different types of sewer and the function of each. 6
- b) Explain with the help of neat sketches, various system of house plumbing for drainage of a building. 7

**OR**

4. a) Discuss various points that should be kept in mind while selecting the site for a sewage pumping station. 7
- b) Enlist the sewer appurtenances. Explain with the help of neat sketch "Drop manhole". 6
5. a) The BOD of a sewage incubated for one day at 30°C has been found to be 100 mg/l. What will be the 5 - day 20°C BOD. Assume  $K = 0.12$  (base 10) at 20°C. 7
- b) Draw a layout of a conventional sewage treatment plant and state function of each unit. 7
- OR**
6. a) Explain physical & chemical characteristics of waste water. 6
- b) Design a primary settling tank of rectangular shape for a town having a population of 50,000 with a water supply of 180 litres per capita per day. 8
7. a) What do you understand by secondary treatment (or biological treatment) of waste water? Enumerate various treatment techniques used for biological treatment. 7
- b) Write the difference between Activated sludge process and trickling filter. 7
- OR**
8. a) Draw a neat sketch of "oxygen sag curve" and explain the characteristics of each zone. 6
- b) Write short notes on - **any two**. 8
- i) Zero discharge concept                      ii) Sludge Digestion Tank
- iii) Sludge drying bed                              iv) Activated sludge process
9. a) Draw neat sketch and explain the working of "Aqua Privy". 6
- b) Design a septic tank for a hostel having 125 persons. Assume data if necessary. 7
- OR**
10. a) Write short note on sullage collection and disposal. 6
- b) Discuss in brief various treatment processes adopted for treating Industrial wastewater. 7
11. a) Write a note on "Effect of air pollution on man and materials". 6
- b) Give the classification of "Air Pollutants" with their sources. 7
- OR**
12. a) Give the list of Air Pollution controlling equipments and explain any one in detail. 7
- b) Write short notes on **any two**. 6
- i) Effect of Air Pollution on Plants & Animals.
- ii) Climate change
- iii) Carbon credit system.

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