

B.E. (Civil Engineering) Third Semester (C.B.S.)
Environmental Engineering - I

P. Pages : 2

Time : Three Hours



NIR/KW/18/3294

Max. Marks : 80

- 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) What is per capita Water Demand? Explain variations in Water Demand. **6**
- b) Determine the population of a city in 2031 by arithmetic increase method & Geometric increase method. **8**
- The data from census record for the city is as follow :

Year	1961	1971	1981	1991	2001
Population in thousand	87	110	145	180	210

OR

2. a) List out the various sources of water & explain any two. **6**
- b) What are intake structure? State requirement of good intake structure. **8**
3. a) In a supply scheme to be design service population of 4 lakh storage reservoir is situated at 8 km away from the source to city is 16 m. Calculate size of supply main using Weisbach and Hazen's Williams formula. Assuming maximum daily demand of 200 LPcd. & half of daily supply is to be pumped is 8 hours. $f = 0.012$ & $CH = 130$. **7**
- b) Explain following pipes with their advantages & disadvantages "Any Two" **6**
- a) Cast Iron Pipe
 - b) Steel Pipe
 - c) Plastic Pipe

OR

4. a) List out the various types of pump used in water supply scheme & explain advantages & disadvantages of reciprocating pump. **7**
- b) Explain with neat sketch **any two**. **6**
- i) Scour Valve
 - ii) Spigot & Socket Joint
 - iii) Pressure Relief Valve

5. a) Draw a flow sheet of conventional water treatment plant & state function of each unit. 7
b) Design a cascade Aerator for a capacity of 12 MLD. 6

OR

6. a) Explain the aim of aeration in water treatment. What are its limitations. 7
b) Write short note on 'Jar test' and its importance. 6
7. a) Explain with neat sketch, the working of a clariflocculator. 6
b) Design a rapid sand filter for a population of 1,00,000 to be served & per capita water supply 270 LPcd. Assume suitable data. 7

OR

8. a) What is Sedimentation? State & explain various factors affecting it. 6
b) Write note on **any two**. 7
i) Operational Problem in filter.
ii) Inlet & outlet arrangement in sedimentation tank.
iii) Criteria for selection of filter sand.

9. a) What is disinfection? What are the various methods of disinfection? Explain any one. 6
b) Explain the mass curve method to find capacity of reservoir? 8

OR

10. a) Explain the various methods used in leakage detection in water pipe line. 6
b) The water work of a town of population 50,000 has to meet its water demand at the rate of 270 LPcd. If the disinfection is to be done by bleaching powder having 40% available chlorine, determine the quantity of bleaching powder required per annum. The required dose of chlorine is $0.5 \text{ mg} / \ell$ for disinfection. 8

11. a) Explain the classification of solid waste on the basis of source of generation. 6
b) Discuss the various methods of collection of solid waste. 7

OR

12. a) Explain in details 'Sanitary Landfill'. 6
b) What are the points to be considered while selecting the site for sanitary land filling? 7

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NJR/KS/18/4349

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 11. Illustrate your answers whenever necessary with the help of neat sketches.
 12. Use of non programmable calculator is permitted.

1. a) Explain the factors affecting per capita demand. 6
- b) The data given below shows details of population of city from year 1930-1970. 7
Calculate the population for the year 1980, 1990 and 2000 by Arithmetic Increase Method.

Year	1930	1940	1950	1960	1970
Population	24000	27000	33000	41000	49000

OR

2. a) Discuss the major objectives of water treatment what are the components of water supply scheme? 6
- b) What are intake structure? State the requirement of good intake suture. 7
3. a) A water supply scheme is to be designed for a city of population 500000. Calculate the size conveyance main. If the storage reservoir is 10 km away from city. Loss of head is 15 m. Assume per capita demand is 150 LPCD pump work for 12 hrs. in a day. Take $f = 0.04$. 7
- b) Explain the following with neat sketch: 7
i) Scour valve
ii) Expansion joint.

OR

4. a) Explain the following with neat sketch **any two**. 8
i) Reflux valve
ii) Spigot and socket joint.
iii) Pressure Relief valve.
- b) List out various types of pumps used in water supply scheme and explain working & the advantages and disadvantages of reciprocating pump. 6

5. a) Explain in brief the physical, chemical and bacteriological characteristics of water. 7
b) Draw a flow sheet of conventional water treatment plant and explain in brief function of each unit. 6

OR

6. a) Explain the aims of aeration in water treatment. What are its limitations. 7
b) Write short note on 'Jar test'. 6
7. a) Derive an equation for settling velocity of discrete particles freely falling in a sedimentation tank. 7
b) Difference between slow sand filter and Rapid sand filter. 7

OR

8. a) Determine the dimensions of Rapid sand filter for 20 MLD. Assume filtration rate is 5000 lit/hr/m². 6
b) Write short note on **any two**. 8
i) Operational problems in filter.
ii) Inlet and outlet arrangement in sedimentation tank.
iii) Criteria for selection of filter sand.
9. a) What are the requirements of good disinfectant and list the various disinfectants used in water treatment plant. 7
b) Explain in detail Dead end system and gird iron system. 6

OR

10. a) Define disinfection. What are the requirements of a good disinfectant? Name the different types of disinfection. 6
b) Write short note on Break point chlorination. 7
11. a) Discuss various methods of collection of solid waste. 6
b) Discuss the composition and sources of generation of municipal solid waste. 7

OR

12. a) What is Municipal Solid Waste? Explain in brief the classification of solid waste with their sources of generation. 6
b) What are the different methods of disposal of municipal solid waste and explain any one. 7

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 12. Use of non programmable calculator is permitted.

1. a) What is per capita demand? Discuss the factors effecting per capita demand. 6
- b) For the given data forecast the population data after one, two and three decades beyond the last known decade by Decrease rate of growth method. 7

Year	1960	1970	1980	1990	2000
Population	23500	27900	35000	41000	47500

OR

2. a) What are 'Infiltration galleries' and 'Infiltration wells'? Explain with neat sketches. 6
- b) What are the points to be considered while making site selection for intake structures? Explain reservoir intake with neat diagram. 7
3. a) With neat diagram explain following joints in pipes. 6
- i) Socket and spigot joints. ii) Flanged joint.
- b) Write note on; 7
- i) Economical diameter of pumping main.
- ii) Factors affecting selection of pumps.

OR

4. a) From a clear water reservoir 3m deep and a maximum water level at 30m water is to be pumped to an elevated reservoir at 75m at a constant rate of 900000 liters per hour. The distance is 1500m. Give the economical diameter of the pumping main and water horse power of the pump. Neglect minor losses take $f = 0.01$. 6
- b) Name the various pipes used in water supply scheme and explain features of cast iron pipe in detail. 7

5. a) What are physical impurities in water? Discuss any two in details. 7
b) Draw a flow sheet of conventional water treatment plant and explain function of each unit. 7

OR

6. a) Discuss the purpose and limitations of aeration. Also explain the features of cascade aerator with design criteria. 7
b) In brief discuss various types of mixing devices for mixing coagulant in water. 7
7. a) With a neat sketch explain the working of a slow sand filter. 6
b) Calculate the dimensions of a rapid sand filter for a population of 2 Lacs and rate of water supply 180 Lpcd. Consider design flow 1.8 times the average flow. Assume 3% of water being used for backwashing. 7

OR

8. a) In a horizontal flow sedimentation tank show that the particle removal depends only on surface overflow rate. 6
b) Design the dimensions of a sedimentation tank to treat a demand of 12 Million litres per day. Assume a detention time of 6 hours and velocity of flow as 20cm/minute. 7
9. a) What is chlorination? Discuss disinfecting action of chlorine. 6
b) Explain the importance of maintaining residual chlorine and discuss breakpoint chlorination. 7

OR

10. a) Discuss mass curve method to find storage capacity of reservoir. 6
b) What is a fire hydrant? With a neat diagram explain post fire hydrant. 7
11. a) What is solid waste? Discuss the various components in municipal solid waste. 7
b) What are the various methods of collection of solid wastes. 7

OR

12. a) Explain landfilling method of solid waste disposal. 7
b) In brief explain various processing techniques used for material recovery from solid waste. 7



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 11. Illustrate your answers whenever necessary with the help of neat sketches.
 12. Use of non programmable calculator is permitted.

1. a) Explain the various types of water demand. Explain the various factors affecting the water demand. **6**

- b) Determine the population of a city in 2031 by arithmetic increase method & Geometric increase method. **8**

The data from census record for the city is as follow.

Year	1961	1971	1981	1991	2001
Population in thousand	87	110	145	180	210

OR

2. a) What are the different sources of water? Explain any two sources with the help of neat sketches. **6**

- b) What are the intake structures? Explain with the help of neat sketch "RIVER INTAKE". **8**

3. a) Explain following pipes with their advantages & Disadvantages **any two**. **6**

- a) Cast iron pipe
- b) Steel pipe
- c) Plastic pipe

- b) In a supply scheme to be design service population of 4lakh storage reservoir is situated at 8 km away from the source to city is 16m. Calculate size of supply main using Weisbach and Hazen's Williams Formula, Assuming maximum dialy demand of 200 Lpcd and half of dialy supply is to be pumped is 8 hours. Assume coefficient of Friction is 0.012 & CH = 130. **7**

OR

4. a) Estimate the size of supply conduits Leading to an adequate service reservoir for small town having population of 25,000 and water supply rate of 135 lpcd. Also Find hydraulic gradient at which pipeline are proposed to be laid. Assume suitable data. **6**

- b) Explain with a neat sketch the working of centrifugal pump. 7
5. a) Draw a flow sheet of conventional water treatment plant & explain the function of each unit. 6
- b) Design a cascade aerator for a capacity of 15 MLd. Take velocity at inlet pipe as 1.2 m/sec. Area requirement for aerator is $0.03 \text{ m}^2/\text{m}^3/\text{hr}$. Numbers of steps as 4 and rise of each step as 0.2m 7

OR

6. a) What is screening? What are the different types of screens used in water treatment. 6
- b) Explain with a neat sketch the working of 'Clariflocculator' 7
7. a) What is sedimentation? State & Explain various factors affecting sedimentation. 6
- b) Design a plain sedimentation tank for a population of 2 lakh with water supply rate 200 Lpcd. Assuming detention period = 60 Minutes velocity = 50cm/min and depth = 3.5M. 8

OR

8. a) Draw a neat sketch of Rapid sand Filter & explain the working and cleaning. 6
- b) Determine the numbers of beds and size of bed for slow sand filter for a city with population of 1,50,000 and average demand of 200 Lpcd. 8
9. a) State various types of disinfectants used in water treatment. State advantages and disadvantages of chlorine as disinfectant. 6
- b) Calculate the quantity of bleaching powder required per day for disinfecting 4 million liters / day. The dose of chlorine has to be 0.5 p.p.m. and the bleaching powder contains 30% of available chlorine. 7

OR

10. a) Explain with the help of neat sketches the Lay-out of distribution system. 6
- b) With a Neat sketch explain surface Reservoir. 7
11. a) Explain the classification of solid waste on the basis of source of generation. 6
- b) Discuss the various methods of collection of solid waste. 7

OR

12. a) Explain in details 'sanitary landfill'. 6
- b) What are the points to be considered while selecting the site for sanitary land filling? 7



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 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Explain the factor affecting per capita demand. **6**
- b) The data given below. Shows details of population of city from year 1970 to 2010. **7**
Calculate the population for the year 2020, 2030 & 2040 by Arithmetic Increase Method.

Years	1970	1980	1990	2000	2010
Population	25000	28000	34000	42000	47000

OR

2. a) Explain the importance and necessity of public water supply scheme. **6**
- b) What is an Intake structure? List out the types of Intake structure and state requirements of a good Intake structure. **7**
3. a) List out the various pipe joints used in water supply scheme and explain socket and spigot joints. **6**
- b) Determine hydraulic gradient for a pipe of diameter 1.6 m carrying water at a rate of $2.40 \text{ m}^3/\text{s}$. Take $f = 0.003$ **7**

OR

4. a) Write a short note on Rising main with labeled diagram. **6**
- b) Compare the merits and demerits of reciprocal and centrifugal pump. **7**
5. a) Enlist the physical, chemical and bacteriological characteristics of water. Explain any one. **7**
- b) Draw a flow sheet of conventional water treatment plant and explain in brief function of each unit. **7**

OR

6. a) Design a cascade aerator for a capacity of 35 MLD. Assume suitable data with a neat sketch. 7
- b) Write short note on various types of Coagulant. 7
7. a) Derive an equation for settling velocity of discrete particles freely falling in a sedimentation tank. 7
- b) Design a rapid sand filter for a population of 1,00,000 to be served and per capita water supply 270 Lpcd. Assume suitable data. 7

OR

8. a) Draw neat sketch of Clariflocculator and explain its working. 7
- b) Clarify the various filters and differentiate "Slow Sand Filter" and "Rapid Sand Filter". 7
9. a) What is disinfection? What are the various methods of disinfection? Explain any one. 6
- b) Explain the mass curve method to find capacity of reservoir? 7

OR

10. a) Chlorine usage in the treatment of $25000 \text{ m}^3/\text{day}$ is 9 kg/day . The residual chlorine after 10 min contact is 0.2 mg/lit . Calculate the dosage in milligrams per litre and the chlorine demand of the water. 6
- b) Explain the various methods used in leakage detection in water pipe line. 7
11. a) What is Solid Waste? Give the classification of Solid Waste with their sources. Explain in brief. 6
- b) Write short note on "Collection methods" of solid waste. 7

OR

12. a) Explain Transfer station and also state the requirement of transportation vehicle. 7
- b) What are the points to be considered while selecting the site for sanitary land fill? Explain. 6

B.E. (Civil Engineering) Third Semester (C.B.S.)
Environmental Engineering – I

P. Pages : 2

Time : Three Hours



TKN/KS/16/7297

Max. Marks : 80

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 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) What is per capita water Demand? Explain variations in water demand. **6**
- b) In a town, it has been decided to provide 200 liters per head per day in the 21st century. Estimate the domestic water requirements of this town in the year AD 2000 by projecting the population of the town by the incremental increase Method from the data given below:- **7**

Year	Population.
1940	2,50,000
1950	4,80,500
1960	5,50,300
1970	6,38,600
1980	6,95,200

OR

2. a) Discuss the major objectives of water treatment what are the components of water supply scheme? **6**
- b) What are intake structure? State the requirement of good intake suture. **7**
3. a) A colony with a population of 35000 is to be supplied water at average daily demand of 210 lpcd. Find the diameter of main to carry maximum daily flow at a velocity of 1.2 m/sec and pump working for 12 hours a day. find the total loss if pipe length is 3 km. Darcy friction factor, $f=0.03$ and minor losses 10 times velocity head. Maximum daily demand is 1.8 times average daily demand. find the power of the pump required to pump this quantity if pump efficiency is 70% the static lift is 30 m. **7**
- b) With neat sketches explain the various types of pipe Joints used in C.I. pipes. **7**

OR

4. a) Explain the following with neat sketch **any two**. **6**
- i) scour valve.
 - ii) Spigot and socket joint.
 - iii) Pressure Relief valve.

- b) List out various types of pumps used in water supply scheme and explain working & the advantages and disadvantages of reciprocating pump. **8**
5. a) Draw a flow sheet of conventional water treatment plant for surface water source and state function of each unit. **6**
- b) Design a cascade Aerator for a capacity 12 MLD. The velocity of inlet pipe is 1.20 m/sec. Draw neat sketch and assume suitable data. **7**
- OR**
6. a) Explain the aims of aeration in water treatment. What are its limitations. **6**
- b) Write short note on 'Jar test'. **7**
7. a) What is sedimentation? State and explain various factors affecting sedimentation. **7**
- b) State the difference between slow sand filter and rapid sand filter. **7**
- OR**
8. a) Determine the dimensions of Rapid sand filter for 20MLD. Assume filtration rate is 5000lit/hr/m². **6**
- b) Write short note on **any two**. **8**
- i) Operational problems in filter.
- ii) Inlet and outlet arrangement in sedimentation tank.
- iii) Criteria for selection of filter sand.
9. a) Chlorine usage in the treatment of 25000 m³/day is 9kg/day. The residual chlorine after 10 minutes contact is 0.2 mg/l. calculate the dosage in milligrams per litre and the chlorine demand of the water. **5**
- b) Write notes on **any two**. **8**
- i) Leakage and detection in water distribution system.
- ii) Mass curve method for the determine of reservoir capacity.
- iii) Layouts of distribution system.
- OR**
10. a) Define disinfection. What are the requirements of a good disinfectant? Name the different types of disinfection. **6**
- b) Write short note on Break point chlorination. **7**
11. a) What are the elements of solid waste management? Explain. **6**
- b) Explain Transfer station and also state the requirements of transportation vehicle. **7**
- OR**
12. a) What is Municipal Solid Waste? Explain in brief the classification of solid waste with their sources of generation. **6**
- b) What are the different methods of disposal of municipal solid waste and explain any one. **7**

NTK/KW/15–7297

Third Semester B. E. (Civil) Examination

ENVIRONMENTAL ENGINEERING I

Time : Three Hours]

[Max. Marks : 80

- N. B. : (1) All questions carry marks as indicated.
(2) All questions are compulsory.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Explain the factors affecting per capita demand
6

(b) The data given below shows details of population of city from year 1930-1970. Calculate the population for the year 1980, 1990 and 2000 by Arithmetic Increase Method.

Year	1930	1940	1950	1960	1970
Popul ⁿ	25000	28000	34000	42000	47000

7

OR

2. (a) What are the different sources of water ? Explain any two of these sources with neat sketch. 7

(b) Describe with neat sketch of Reservoir Intake.
6

NTK/KW/15–7297

Contd.

3. (a) A water supply scheme is to be designed for a city of population 500000. Calculate the size conveyance main. If the storage reservoir is 10 km away from city. Loss of head is 15 m. Assume per capita demand is 150 LPCD pump work for 12 hrs. in a day. Take $f = 0.04$ 7
- (b) Explain the following with neat sketch :—
- (i) Scour valve
- (ii) Expansion joint. 6

OR

4. (a) Write a short note on Raising Main with labeled diagram. 6
- (b) Explain with a neat sketch the working of centrifugal pump. 7
5. (a) Explain in brief the physical, chemical and bacteriological characteristics of water. 7
- (b) Draw a flow sheet of conventional water treatment plant and explain in brief function of each unit. 7

OR

6. (a) Design a cascade aerator for a capacity of 10 MLD. Assume suitable data with a neat sketch. 7
- (b) Explain with neat sketch of Jar Test. 7

7. (a) Derive an equation for settling velocity of discrete particles freely falling in a sedimentation tank. 7
- (b) Difference between slow sand filter and Rapid sand filter. 7

OR

8. (a) Write a short notes on Inlet and outlet arrangement in sedimentation tank. 7
- (b) A town having population 1.5 lac per capita demand being 180 lpcd. Determine number and size of Rapid sand filter unit. 7
9. (a) What are the requirements of good disinfectant and list the various disinfectantes used in water treatment plant. 7
- (b) Explain in detail Dead end system and grid iron system. 6

OR

10. (a) Explain the Mass curve method to determine the storage capacity of reservoir. 7
- (b) Briefly explain break point chlorination with sketch. 6
11. (a) Discuss various methods of collection of solid waste. 6
- (b) Discuss the composition and sources of generation of municipal solid waste. 7

OR

12. (a) What are the points to be considered while selecting the site for sanitary land fill ? Explain.

6

(b) List out the various methods of disposal of solid waste. Explain Sanitary land filling in detail.

7