Code No: **RT41011**

R13

Set No. 1

IV B.Tech I Semester Regular Examinations, November - 2016
ENVIRONMENTAL ENGINEERING – II
(Civil Engineering)

Time: 3 hours   **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Differentiate sewage, sewer and sewerage systems and discuss their importance.   [3]

    b) Explain need for pumping stations in sewerage systems .Discuss the factors to be
        considered in locating the pumping stations in sewerage systems.   [4]
    c) Define BOD and COD, and explain the importance in sewage treatment.   [4]
    d) Enumerate the principle of Biological treatment indicating end products.   [4]
    e) Draw the sketch of Imhoff tank and explain its function.   [4]
    f) Mention different steps in biological sludge management and discuss.   [3]

PART–B *(3x16 = 48 Marks)*

2. a) Mention various formulae generally used in the design of sewers and analyze.   [8]

    b) A RCC sewer of diameter 500 mm is laid at a slope of 1in 750.Using Kutters C in
        Chezy's formulae, find the velocity and discharge when it is flowing flow n=0.012. [8]

3. a) Discuss the factors to be considered in selection of pumps in water supply. Mention
        types of pumps for water supply indicating merits and demerits of each.   [8]
    b) Enumerate the principles involved in the planning and design of building drainage. [8]

4. a) Derive a mathematical model for first stage BOD reaction. Mention basic
        assumptions.   [8]
    b) The BOD_5 @20ºC of a sewage is 220mg/L. Determine BOD_5 @30ºC.Assume
        k_{20}=0.12d$^{-1.}$ [8]

5. a) With a neat sketch explain the function of Activated Sludge Process and also mention
       its modifications and discuss.   [8]
   b) Determine the volume of aeration tank of Activated sludge process given the BOD of
       sewage as 250mg/L, MLSS-2750mg/L, and F/M-0.30 and sewage flow 5MLD.Also
       estimate aerators capacity. Assume suitable data.   [8]

6. a) Draw the sketch of UASB and explain its function with merits and demerits.   [8]
   b) Design a septic tank for 150 users and draw the sketch. Follow BIS 2470 design
       procedure.   [8]

7. a) Enumerate anaerobic sludge digestion process with a neat diagram of digester.   [8]
   b) Explain the phenomenon that occur - self purification of water bodies with oxygen-
       sag curve   [8]

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Set No. 2

IV B.Tech I Semester Regular Examinations, November - 2016
ENVIRONMENTAL ENGINEERING – II
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) Define health and sanitation. Mention various components of sanitation.   [3]
    b) Analyze the need for plumbing in a building.   [3]
    c) Design a Primary sedimentation tank for discharge of 10 MLD in an activated sludge   [4]
       process. Assume relevant data.
    d) Explain the functioning of Oxidation pond with a diagram.   [4]
    e) Discuss the functioning of Membrane reactors.   [4]
    f) Enumerate different methods used for disposal of treated sewage.   [4]

PART–B *(3x16 = 48 Marks)*

2. a) Discuss the various methods for estimating sewage flow and storm water flow.   [8]
    b) Determine the design peak flow in m^3/sec for an area of 6.25 Sq.km with a density of
       population of 330/Hectare. Assume per capita water supply as 150lpcd and sewage
       contribution of 70% of water supply.   [8]

3. a) What is a Pump? Classify the pumps based on mechanical principles indicating
       merits and demerits of each type of pump.   [8]
    b) Estimate capacity of centrifugal pump in Hp to pump water to discharge 1.5m^3/sec.
       Delivery head-12m and Suction head-5m.Efficiency of the pump-75%.   [8]

4. a) Explain the need for sewage treatment. What is the importance of primary treatment
       and also mention various units with their objectives.   [8]
    b) Determine the settling velocity grit particle of diameter 0.15mm, given the
       temperature of waste water as 30ºC, density of the particle 2.40g/cc. Also calculate
       the surface loading rate for the grit chamber. Assume data if needed.   [8]

5. a) Discuss the principle of aerobic and anaerobic biological treatment process along
       with merits and demerits.   [8]
    b) Design a high rate Trickling Filter to treat 30 MLD of sewage. Assume suitable
       design data.   [8]

6. a) Write about need for Nitrification and De-nitrification.   [8]
    b) Design septic tank with two chambers to treat sewage for 300 persons. Follow design
       procedure as given in BIS 2470(Code of practice for design and construction of
       septic tanks).   [8]

7. a) Draw the Oxygen Curve and discuss its significance in self purification water bodies.   [8]
    b) Write about the importance of sludge thickening in sludge management. Draw sludge
       thickener and explain.   [8]

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Set No. 3

IV B.Tech I Semester Regular Examinations, November - 2016
ENVIRONMENTAL ENGINEERING – II
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) Mention different types of Sewerage systems and explain merits and demerits of each.   [4]

    b) Explain one pipe and two pipe systems of building drainage.   [3]

    c) Design a grit Chamber to treat 10MLD of sewage. Assume surface loading rate of 1200m3/day/m^2 and HDT of 60 seconds. Mention velocity control devices.   [4]

    d) With help of neat diagram explain the functioning of RBC.   [4]

    e) Explain the methods to remove nitrate and phosphorous.   [4]

    f) Discuss the method of disposal of sewage on land and soil sickness.   [3]

PART–B *(3x16 = 48 Marks)*

2. a) Mention important formulae used for design of sewers and analyze each of the methods. Also mention Chezy,s **C** and Manning,s **n** values for different type of pipes.   [8]

    b) Estimate the peak flow in m^3/sec. for the design of sewers for a population of 240/Hectare spread over an area 12Sq.Km.Assume water supply of 135lpcd with a sewage generation of 75% of the water supply. Peak factor2.25.   [8]

3. a) Design the capacity of centrifugal pump in horse power to discharge a flow of 1.75m^3/Sec. with a Suction and Delivery head of 5m and 24m respectively. Efficiency of the pump may be taken as 68%.Assume any relevant data.   [8]

    b) Mention various appurtenances used in Sewerage system discuss their role.   [8]

4. a) Enumerate the importance of Primary Treatment. Mention various unit operation and explain their objectives,   [8]

    b) Assume BOD$_5$@20°C of sewage as 275 mg/L for three samples with different k$_{20}$ values of   0.12d^{-1}, 0.13d^{-1} and 0.15d^{-1}.Determine ultimate BOD of each of the samples.   [8]

5. a) Draw process flow diagram of high rate two stage trickling filter and discuss its function. Also explain the importance of recirculation. [8]

    b) Discuss in detail three important modifications in Activated sludge process with neat sketches with important design parameters. [8]

6. a) Explain the final end products of Anaerobic process. With the help of the sketch explain UASB process. [8]

    b) Differentiate and discuss the functioning of Septic tank and Imhoff tank. [8]

7. a) Explain the different steps in anaerobic digester with the fate of end products. [8]

    b) Explain various stages in self purification of water body along with oxygen sag curve. [8]

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Set No. 4

IV B.Tech I Semester Regular Examinations, November - 2016
ENVIRONMENTAL ENGINEERING – II
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) Mention the appurtenances used in sewerage systems and explain with sketches. [4]

    b) Write about factors to be considered in Building drainage system. [3]

    c) Enumerate sedimentation and floatation and the difference between them. [4]

    d) Draw the sketch of a Fluidized bed and explain its functioning. [4]

    e) Discuss the working of UASB and Membrane reactors. [3]

    f) Analyze the role of sludge management in Sewage Treatment. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Write in detail about various components in Sanitation. [8]

    b) Discuss various factors that need to consider in design of sewerage system. [8]

3. a) Write about different types of pumps and factors to be considered in selection of pumps for sewerage. [8]

    b) Enumerate one and two pipe system of plumbing along with merits and demerits of each system. [8]

4. a) Define BOD and COD. Derive a mathematical expression for first order BOD. Also discuss first stage and second stage BOD. [8]

    b) Estimate BOD_5@20°C whose BOD_8@ 20° C is given as 160mg/L. Assume BOD rate constant k_e= 0.225d^{-1}. [8]

5. a) Explain the basic process of removal BOD in a Trickling filter. Name the modification and explain each modification with a neat sketch. [8]
    b) Design an Oxidation pond to treat sewage for a population of 10000. Capita Water Supply may be assumed as 135lpcd .Sewage discharge may assume - as 75% of water supply with a BOD_5 of 240mg/L. The BOD_5 loading rate =225kg/day/Hectare. Draw the sketch of oxidation pond for the design. [8]

6. a) Enumerate Integrated Fixed film Reactors and mention the type of reactors. Also state the disadvantages of and advantages of this type treatment. [8]
    b) Design single chamber septic tank to treat sewage for 60 persons. Follow procedure as given in BIS 2470 (Code of practice for design and construction of septic tanks). Draw the sketch of septic tank for the design. Assume 4 persons per family. [8]

7. a) Discuss the significance of sludge Digestion in Activated sludge Process and Trickling filter. Also explain the principle of anaerobic process. [8]
    b) Explain the phenomena of self purification in running streams. Draw the oxygen sag curve and explain its significance. [8]

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Code No: **RT41011**

IV B.Tech I Semester Supplementary Examinations, March - 2017
ENVIRONMENTAL ENGINEERING – II
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A(22Marks)

1. a) Write short note on manhole [4]
    b) Differentiate between one pipe and two pipe system. [4]
    c) Discuss the significance of BOD/COD ratio. [3]
    d) Write brief note on Oxidation Pond. [4]
    e) What is meant by nitrification and de- nitrification? [3]
    f) Write about the importance of sludge thickening in sludge management. [4]

PART–B (3x16 = 48 Marks)

2. a) Explain the systems of sanitation. [8]
    b) Determine the size of a circular sewer for a discharge of 800 lps running half-full. Assume hydraulic gradient of 1 in 1250 and Manning's constant n=0.012. [8]

3. a) Under what circumstances pumping of sewage is needed. Enumerate the problems faced during pumping of sewage. [8]
    b) Explain the principles involved in designing of building drainage. [8]

4. a) A 2% dilution of sewage sample is incubated for 5 days at $20^{\circ}C$. The depletion of oxygen was found to be 4 ppm. Determine the BOD_5 of sewage at $20^{\circ}C$. Calculate ultimate BOD and 2 day BOD at $35^{\circ}C$. [8]
    b) Write short note on i) Screening and ii) Grit chamber [8]

5. a) Design an Activated sludge plant to treat domestic sewage, based on the following data

Population	: 50,000
Average sewage flow	: 120 lpcd
BOD of sewage Influent	: 200 mg/lit
MLSS	: 2000 mg/lit
F/M ratio	: 0.3

[8]
    b) Explain with neat sketch the working principle of standard rate trickling filter. [8]

6. a) Write in detail about the UASB reactor with neat sketch, advantages and disadvantages. [8]
    b) Explain with neat sketch the working principle of septic tank. [8]

7. a) Draw a typical oxygen sag curve and explain its significance in river pollution. [8]
    b) Explain the term sewage sickness and its remedial measures. [8]

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