

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the need and importance of protected water supply to a community. (05 Marks)
 b. Explain briefly different types of water demand. (05 Marks)
 c. Briefly explain :
 (i) Factors affecting per capita demand of water.
 (ii) Factors affecting design period (06 Marks)

OR

- 2 a. List different methods of populations forecasting. Explain briefly any two methods. (08 Marks)
 b. The population census of a city is as shown in the following table. Estimate the expected population of the city by 2041 using arithmetical increase method and geometrical increase method.

Year	1971	1981	1991	2001	2011
Population in lakhs	1.50	1.85	2.18	2.50	2.85

(08 Marks)

Module-2

- 3 a. What are the objectives of water treatment? Draw a flow chart of conventional water treatment plant and indicate various units. (08 Marks)
 b. Classify various sources of water and explain briefly their suitability with respect to quantity and quality for a town. (08 Marks)

OR

- 4 a. What is sampling of water? Discuss the objectives of sampling and preservative techniques. (06 Marks)
 b. Explain briefly physical, chemical and bacteriological water quality characteristics. (06 Marks)
 c. Give the maximum permissible limits as per the BIS for the following water quality parameters:
 (i) Total hardness (ii) Fluoride (iii) Nitrate (iv) Iron. (04 Marks)

Module-3

- 5 a. What is Sedimentation process? With the help of sketch of an ideal settling tank, show that the efficiency of the settling tank is independent of its depth. (05 Marks)
 b. Design a set of here circular settling tanks to handle 6 million litres of water per day. Take detention time as 4 hours and side water depth as 3m. Check for the design and sketch the designed tank. (06 Marks)
 c. What is coagulation of water? Estimate the quantity of alum required per month at a treatment plant to treat 10 MLD of water with alum dosage of 20 mg/ℓ. (05 Marks)

OR

- 6 a. Briefly explain the mechanism of filtration. (04 Marks)
 b. With the help of a sketch explain the working of a rapid sand filter. (06 Marks)

- c. Design a set of Ten slow sand filter units to treat water for a town of 2 lakh population with assured water supply of 135 lpcd and maximum daily water is 1.5 times the average demand. The rate of filtration is 200 litres per square metre per hour (06 Marks)

Module-4

- 7 a. What are the objectives of water softening? Give a comparison of Lime - Soda process with Zeolite process of water softening. (05 Marks)
- b. A river was proposed as the raw water source for a near by town. Chemical analysis of the water indicates the constitutes as given below. If the hardness of water supplied to the residents is to be limited to 160 mg/ℓ, determine the need of softening if any.
- | | |
|---|----------------------------|
| Zn = 4 mg/ℓ | Na ⁺ = 18 mg/ℓ |
| Cl ⁻ = 68 mg/ℓ | Mg ²⁺ = 16 mg/ℓ |
| SO ₄ ²⁻ = 20 mg/ℓ | Ca ²⁺ = 60 mg/ℓ |
| Turbidity = 45 mg/ℓ | Alkalinity = 45 mg/ℓ |
- Given equivalent weight of Ca²⁺ = 20; Mg²⁺ = 12.2 and CaCO₃ = 50. (05 Marks)
- c. Estimate the quality of Zeolite required to soften 2 MLD of water with hardness 360 mg/ℓ which should be reduced to 60 mg/ℓ. The interval between successive regeneration is 4 hours and the capacity of exchanger is 24000 grams/cu.m. (06 Marks)

OR

- 8 a. What is disinfection of water? What are the requirements of a good disinfectant? (04 Marks)
- b. A college hostel having 500 students used well water for drinking. The rate of water supply is 120 lpcd. The water is to be disinfected using bleaching powder containing 25% chlorine available. Determine the monthly requirement of the bleaching powder with the following data:
- (i) Chlorine demand of well water = 1.2 mg/ℓ
- (ii) residual Chlorine expected = 0.2 mg/ℓ (06 Marks)
- c. Write a note on : (i) Fluoridation (ii) De-fluoridation (06 Marks)

Module-5

- 9 a. What are intake works? What are the factors to be considered for selection of site intake structures? (05 Marks)
- b. Write a note on : (i) Pumps and their types (ii) Pipe materials and pipe appurtenances (06 Marks)
- c. A town with prospective population of 80,000 is to be supplied with water from a river 5 km away and 25m below the level of the town. Design the economical section of the rising main and pumping unit where power is available. Take water supply rate as 150 lpcd and $f = 0.01$. Assume other relevant details if required. Given pumping hours = 12/day. (05 Marks)

OR

- 10 a. Explain the various methods of water distribution system. (05 Marks)
- b. For the water supply of a small rural town with the population of 10,000 with the rate of water supply as 100 lpcd. It is proposed to construct a distributing reservoir. The pattern of draw off is as under.
- | | | | |
|---------------|-------|-----|----------------|
| 5 am to 10 am | | 75% | of days supply |
| 10 am to 4 pm | | 10% | - " - |
| 4 pm to 9 pm | | 13% | - " - |
| 9 pm to 5 am | | 2% | - " - |
- The pumping is to be done for 8 hrs per day (8 am to 4 pm). Determine the storage capacity of the reservoir. (06 Marks)
- c. Write a note on different types of water distribution reservoir. (05 Marks)

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Draw neat sketches wherever necessary.

Module-1

- 1 a. Discuss the need for a protected water supply. (06 Marks)
b. List the various types of water demand and explain any four only. (10 Marks)

OR

- 2 a. Explain the term "Design Period" and factors affecting the same. (06 Marks)
b. The census record of a town shown population of 50000, 110000 and 160000 for the years 1971, 1991, 2011 respectively. Estimate
i) Saturation population and
ii) Expected population in 2031. Use Logistic curve method. (06 Marks)
c. Explain the term variations in demand of water. (04 Marks)

Module-2

- 3 a. Draw a neat treatment flow chart for a river source drawn from a balancing reservoir and explain the significance of each unit operation or process. (10 Marks)
b. Explain the term surface and sub – surface sources. (06 Marks)

OR

- 4 a. Explain the grab sampling and composite sampling techniques for water. (04 Marks)
b. Discuss the terms Palatability and Wholesomeness of water. (04 Marks)
c. Give the permissible limits (as per IS 10500 : 1991) and ill effects caused if exceeded (for any eight parameters only) in water used for drinking purpose. (08 Marks)

Module-3

- 5 a. Explain the term plain sedimentation and sedimentation aided with coagulation. (08 Marks)
b. A settling tank with a continuous flow regime is 3m deep and 60m long. Determine the velocity of water to be maintained for effective removal of particles for the following data :
Diameter of particle = 0.025mm ; Sp. gr. Of particles = 2.65 ;
Kinematic viscosity of water at 25°C = 0.01 cm²/sec. (08 Marks)

OR

- 6 a. Explain the theory of Filtration. (04 Marks)
b. Discuss the types of filters used and their classification. (06 Marks)
c. Design a rapid sand filter unit for 4 MLD water supply.
Assume 4% filtered water for washing every day.
Rate of filtration = 5000 litres/hr/m².
Length of filter bed = 1.5 × width.
30 minutes are lost every day for washing filter. (06 Marks)

Module-4

- 7 a. Give the comparison between Lime soda process and Zeolite process of softening water. (10 Marks)
b. Explain briefly with a neat sketch, the principle showing Reverse Osmosis. (06 Marks)

OR

- 8 a. Discuss the emphasis on treatment of water for community bathing during a fair. (06 Marks)
b. Explain briefly available technologies for Defluoridation of water. (06 Marks)
c. Write a note on waterborne diseases and their prevention. (04 Marks)

Module-5

- 9 a. Define the term intake structures and illustrate with neat sketches river intake. (06 Marks)
b. Obtain the size of the "Main" and BHP of pump required for following data :
Population of Town = One Lakh ; Per capita demand = 150 Lpcd ;
Length of pipe = 1800 m ; RL of sump = 100.00 ;
RL of service reservoir = 136.00 ; Maximum demand = $1.8 \times$ Average demand
Working hour of pumps = 12 hours ; Flow velocity, through pipe = 1.5 m/s
Hazen William's coefficient = $C_H = 120$ for material of pipe. (10 Marks)

OR

- 10 a. Explain the different pipe materials used in water supply scheme along with advantages and disadvantages. (08 Marks)
b. Explain methods of Distribution system. (08 Marks)

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Assume any suitable data if necessary.

Module-1

- 1 a. Explain the different types of water demand. (06 Marks)
b. What is meant by per capita demand? List and discuss the factors that affect the per capita demand. (10 Marks)

OR

- 2 a. The population of the city in successive decennial census is given as 41500 and 57500. Assuming the census date as 10th April, find the midyear population as 10th July for
i) 3rd Inter – Censal year and (08 Marks)
ii) 6th Post – Censal year by Arithmetical increase method and Geometrical increase method.
b. With the help of neat sketch, explain in detail the variations in demand of water and effect of these variations on the design of various units of water supply scheme. (08 Marks)

Module-2

- 3 a. Write a neat flow sheet of municipal water treatment plant with significance of each unit. (08 Marks)
b. Discuss on surface and subsurface water sources with regard to their quality and quantity. (08 Marks)

OR

- 4 a. List the objectives of water quality analysis. (04 Marks)
b. Differentiate between composite sampling and grab sampling. (04 Marks)
c. Write desirable limits of the following parameters as per BIS 10500 – 2012.
i) Colour ii) pH iii) Total hardness iv) Nitrate v) Iron vi) Fluoride
vii) Total dissolved solids viii) Chlorides. (08 Marks)

Module-3

- 5 a. The maximum daily demand at a water purification plant has been estimated as 12 million litres per day. Design the dimensions of a suitable sedimentation tank (Fitted with mechanical sludge removal arrangements) for the raw supplies, assuming a detention period of 6 hours and velocity of flow as 20cm/min. (06 Marks)
b. Explain in detail the theory of filtration. (10 Marks)

OR

- 6 a. Discuss in detail the operational problems in filters. (10 Marks)
b. Bring out the differences between ultra and micro filtration. (06 Marks)

Module-4

- 7 a. A sample of raw water contains 200 mg/ℓ alkalinity, 50mg/ℓ hardness as CaCl₂ and 75mg/ℓ hardness as MgSO₄. Compute the quantities of lime and soda required to treat 1 million litres of water. If slaked lime 85% purity is available in place of pure lime. What will be the required quantity of slaked lime? (08 Marks)

- b. Explain the concept of reverse osmosis in water treatment with aid of neat sketch.

(08 Marks)

OR

- 8 a. Differentiate between the following :

(08 Marks)

- i) Plain chlorination and Super chlorination.
- ii) Double chlorination and de – chlorination.
- iii) Pre – chlorination and Post – chlorination.
- iv) Disinfection and Sterilization.

- b. Explain Defluoridation and Fluoridation.

(08 Marks)

Module-5

- 9 a. For a water supply of a town, water is pumped from a river 2 km away into a reservoir. The maximum difference of levels of water in river and reservoir is 25m. the population of town is 80000 and per capita water demand is 125 litres per day. If pumps are to operate for a total of 8 hours and the efficiency of the pump is 80%. Determine the horse power of the pumps. Assume friction factor as 0.03 and velocity of the flow as 2m/s and maximum daily demand as 1.5 times the average daily demand.

(08 Marks)

- b. With the help of neat sketch, explain twin well type of river intake.

(08 Marks)

OR

- 10 a. Write short notes on any two :

(08 Marks)

- i) Corrosion in pipes
- ii) Reflux value
- iii) Fire hydrant.

- b. List the advantages and disadvantages of dead end system.

(04 Marks)

- c. Differentiate between continuous and intermittent system of water supply.

(04 Marks)

Sixth Semester B.E. Degree Examination, June/July 2019
Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Assume suitable data wherever necessary.*

Module-1

- 1 a. Explain the importance and need for protected water supply. (06 Marks)
 b. Enumerate the fire demand in water supply. (03 Marks)
 c. The population of a city in three consecutive years i.e. 1991, 2001 and 2011 in 80,000, 2,50,000 and 4,80,000 respectively. Determine: (i) The saturation population (ii) The equation of logistic curve (iii) The expected population in 2021. (07 Marks)

OR

- 2 a. What is meant by per capita demand? (02 Marks)
 b. Explain geometrical and incremental increase method of population forecasting. (07 Marks)
 c. The following population data are available for a town. Estimate the probable population in the year 2031 by geometrical and incremental increase methods:

Year	1971	1981	1991	2001
Population	80,000	1,20,000	1,68,000	2,28,000

(07 Marks)

Module-2

- 3 a. Explain the objectives of water treatment. (06 Marks)
 b. List the physical water quality characteristics. (03 Marks)
 c. Discuss the complete sequence of water treatment plant with a flow diagram. (07 Marks)

OR

- 4 a. What are the objectives of water quality management? (05 Marks)
 b. Discuss the effect of excess concentration of hardness, nitrogen and fluoride in drinking water. (06 Marks)
 c. Explain the importance of bacteriological tests in determining the quality of drinking water. (05 Marks)

Module-3

- 5 a. Define surface flow rate and detention period for a sedimentation tank. (04 Marks)
 b. Describe briefly the various constituents of coagulation sedimentation tank. (06 Marks)
 c. A rectangular settling tank without mechanical equipment is to treat 1.8 MLD of raw water. The sedimentation period is to be 4h, the velocity of flow is 8 cm/min, and the depth of the water and sediment is 4.2 m. If an allowance of 1.2 m for sediment is made, what should be (i) the length of the basin (ii) the width of the basin? (06 Marks)

OR

- 6 a. Explain with a neat sketch the working and back washing of rapid gravity sand filter. (10 Marks)

- b. Find the area and number of units required for rapid sand filtration to serve a population of 2,00,000. Take average rate of demand = 160 lpcd and maximum demand as 1.8 times.
Rate of filtration = $5 \text{ m}^3/\text{h}/\text{m}^2$
Size of each filter = $10 \text{ m} \times 5 \text{ m}$ (06 Marks)

Module-4

- 7 a. List the requirement of good disinfectant. (03 Marks)
b. Explain the theory of chlorination of water with chemical equations. (08 Marks)
c. Enumerate the treatment of swimming pool water. (05 Marks)

OR

- 8 a. What is softening of water? Discuss the lime soda process of water softening with chemical equations. (10 Marks)
b. Explain the reverse osmosis process of softening of water. (06 Marks)

Module-5

- 9 a. Discuss the factors governing the selection of source of water for water supply scheme. (04 Marks)
b. Explain with a neat sketch a wet intake tower structure. (06 Marks)
c. For water supply of a town, water is pumped from a river 3 km away into a reservoir. The maximum difference of levels of water in river and the reservoir is 20 m. The population of the town is 50000 and per capita demand is 120 c/d. If pumps are to operate for a total of 8 hr and the efficiency of pumps is 80%, determine the horse power of the pumps. Assume average daily demand as 1.5 times the average. $f' = 0.03$ and $v = 2\text{m}/\text{sec}$. (06 Marks)

OR

- 10 a. Discuss the various methods of distribution of water and give the advantages and disadvantages of any two systems. (08 Marks)
b. What is service reservoir? Explain with a neat diagram. (08 Marks)

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Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Municipal and Industrial Waste Water Engineering

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Draw neat sketches wherever necessary.
 3. Assume suitable data wherever necessary.*

Module-1

- 1 a. Discuss briefly types of Sewerage System. (05 Marks)
 b. Explain the various types of materials used for sewer construction. (05 Marks)
 c. Compute the population served, drainage area and diameter of storm water sewer (outfall) for the following data:
 For Sanitary sewer:
 "Flowing full" discharge = $0.02 \text{ m}^3/\text{s}$
 "Design" discharge (per capita) = $1.5114 \text{ m}^3/\text{person}/\text{day}$
 For Drainage area and Outfall sewer:
 Population density = 75 persons per hectare
 Coefficient of runoff = $C = 0.278$ (for area, A in km^2)
 Intensity of rainfall = 107 mm/hour (Based on 10 year rainfall frequency curve and time of concentration = 20 minutes)
 Velocity of flow in storm sewer = 3.0 m/s (Discharge measured in m^3/s). (06 Marks)

OR

- 2 a. Explain with a neat diagram Drop Manhole. (05 Marks)
 b. Illustrate the working principle of oxidation pond as a Low Cost Treatment Method. (05 Marks)
 c. A city has three streams carrying waste water with discharges of 350 MLD, 300 MLD and 250 MLD. $\text{BOD}_{5d, 20^\circ\text{C}}$ of streams are 300 mg/L, 290 mg/L and 270 mg/L respectively. Compute the BOD loading (total) in tons per annum. If TSS/BOD Ratio = 1.3, determine total TSS loading. (06 Marks)

Module-2

- 3 a. A 3m diameter circular sewer discharges $3 \text{ m}^3/\text{s}$ of sewage into a pump well. The waste water level in the pump well rises to full depth of 3 m above invert of incoming sewer.. Assuming Manning's value of 0.012 and gradient of 0.5/1000 determine the velocity of flow and ratio of discharge (q) to full discharge ($Q_{\text{full}} = 10.856 \text{ m}^3/\text{s}$). (05 Marks)
 b. Explain the self purification of streams with a Sag curve. (05 Marks)
 c. Discuss the various flow-friction formulae used in design of sewers. (06 Marks)

OR

- 4 a. Find out where critical DO occurs in a fully saturated river (with DO) for the following data:
 City discharge = $100 \text{ m}^3/\text{s}$
 Minimum river discharge = $1250 \text{ m}^3/\text{s}$; Minimum velocity in river = 0.15 m/s
 $\text{BOD}_{5d, 20^\circ\text{C}} = 260 \text{ mg/L}$; Coefficient of purification of river = 4.0
 Coefficient of DO = 0.11
 Ultimate BOD = 125% of BOD of mixture of sewage and river water. (05 Marks)

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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- b. Explain the term "Zone of Purification" in a river. (05 Marks)
c. Derive the Streeter-Phelps Oxygen Sag equation in river analysis. (06 Marks)

Module-3

- 5 a. Explain the various waste water characteristics. (05 Marks)
b. Distinguish between Grab sampling and Composite sampling. (05 Marks)
c. Draw a neat flow diagram of a domestic sewage treatment plant showing various unit operations and unit processes and briefly explain. (06 Marks)

OR

- 6 a. Explain with a neat sketch working of a Trickling filter. (05 Marks)
b. Distinguish between suspended growth and fixed film biological processes. (05 Marks)
c. Design a set of two rectangular primary settling tanks for type-I settling of sewage for an average flow of 20000 m³/d, design SOR of 40m³/m².d. Draw a neat sketch of the same. Assume peak flow = 2.5 times average flow check whether the design ensures safety against re-suspension if max. scour velocity = 0.06 m/s. (06 Marks)

Module-4

- 7 a. Discuss the effect of effluent discharge on streams. (05 Marks)
b. Explain the terms volume reduction and strength reduction of industrial waste water. (05 Marks)
c. How is shock loading on treatment plants prevented using equalization and proportioning. (06 Marks)

OR

- 8 a. Explain the advantages and disadvantages of combined treatment of industrial waste with domestic waste water. (05 Marks)
b. Discuss the methods of removal of "inorganic solids" from industrial waste water. (05 Marks)
c. Explain the methods of maintaining quality in a stream using effluent and stream standards. (06 Marks)

Module-5

- 9 a. Explain the effect of dairy waste on receiving streams and give a treatment proposal. (05 Marks)
b. Explain the treatment of cane sugar effluent with the help of a flow chart. (05 Marks)
c. Explain the role of anaerobic stabilization ponds as energy efficient method of treating distillery waste. (06 Marks)

OR

- 10 a. Give the schematic flow diagrams of cotton textile industry showing the generation of wastewater. (05 Marks)
b. Give the typical characteristics of Indian tannery industrial waste water. (05 Marks)
c. Tuna fish canning industry is proposed near the coast. What are the expected operations leading to discharge of waste? Also give the treatment strategy. (06 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2019
Municipal and Industrial Waste Water Engineering

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Any missing data can be assumed.*

Module-1

- 1 a. Define sanitation. Mention advantages and disadvantages of different methods of sewage disposal. (08 Marks)
 b. Name different types of sewage system with their advantages and disadvantages. (08 Marks)

OR

- 2 a. With sketch explain shapes of sewers. (08 Marks)
 b. Draw a neat plan showing house drainage connections with labeling parts. (08 Marks)

Module-2

- 3 a. What is self purification of stream? With sketch, explain oxygen sag curve. (08 Marks)
 b. With sketch explain zones of purification. (08 Marks)

OR

- 4 a. What is sewage sickness? Mention methods used to prevention of sewage sickness? (08 Marks)
 b. A wastewater effluent of 560 l/sec with BOD = 50 mg/l, dissolved oxygen = 3.0 mg/l and temperature of 23°C enters a river where the flow is 28 m³/sec and BOD = 4.0 mg/l, D.O = 8.2 mg/l and temperature is 17°C. K₁ of the waste is 0.1 per day at 20°C. The velocity of water in the river downstream is 0.18 meter/sec and depth of 1.20 mts. Determine following after mixing of waste water with the river (i) Combined discharge (ii) BOD (iii) D.O (iv) Temperature. (08 Marks)

Module-3

- 5 a. Draw a flow diagram of municipal waste water treatment plant with their operation units. (08 Marks)
 b. Briefly explain characteristics of domestic waste water. (08 Marks)

OR

- 6 a. List the difference between activated sludge process and trickling filters. (08 Marks)
 b. With sketch explain grit chamber and skimming tank. (08 Marks)

Module-4

- 7 a. Mention the differences between domestic waste water and industrial waste water. (08 Marks)
 b. Write note on:
 i) Volume reduction
 ii) Strength reduction
 iii) Neutralization
 iv) Equalization (08 Marks)

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

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OR

- 8 a. What are the merits and demerits of municipal and industrial waste water combined treatment methods. (08 Marks)
b. Briefly explain methods used to removal of organic and inorganic salts from waste water. (08 Marks)

Module-5

- 9 a. Explain with flow diagram, treatment option for distilleries plant. (08 Marks)
b. With the help of flow chart, mention sources and characteristics of waste water from tannery. (08 Marks)

OR

- 10 a. Explain with flow diagram, treatment option for sugar mills. (08 Marks)
b. With the help of flow chart, mention sources and characteristics of waste water from pharmaceutical industry. (08 Marks)

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Seventh Semester B.E. Degree Examination, Dew4,,ver—T/Jan.2020
Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 80

- Note: 1.** Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any suitable missing data.

Module-I

- 1 a. Explain briefly the different types of sewerage system. (06 Marks)
b. Explain the various factors affecting the dry weather flow. (04 Marks)
c. The drainage area of one sector of a town is 20 hectares. The classification of the surface of this area is as follows :

% Total surface area	Type of surface	Run — off coefficient
25	Hard pavements	0.85
25	Roof surface	0.80
15	Unpaved street	0.30
25	Gardens and Lawns	0.15
10	Wooded area	0.10

If the time of concentration for the area is 30 minutes. Find the maximum run off. Use the following formula for intensity of rainfall $R = 900/(t + 60)$. (06 Marks)

OR

- 2 a. Briefly explain the essential requirements of a good sewer material. (04 Marks)
b. Explain with a neat sketch, working of an "oxidation pond". (06 Marks)
c. Explain with a neat sketch, construction and working of a manhole. (06 Marks)

Module-2

- 3 a. Briefly explain self cleaning velocity and non scouring velocity. (04 Marks)
b. State the hydraulic formulas for velocity which are commonly adopted in the design of sewers. Explain any one in brief. (06 Marks)
c. A stone — ware sewer having 30cm in diameter is laid at a gradient of 1 in 100 use $N = 0.013$ in Manning's formula. Calculate the velocity, discharge and Chezy's co-efficient when the sewer is running full. (06 Marks)

OR

- 4 a. Explain the phenomenon of self— purification of natural streams subjected to pollution with the help of oxygen — sag curve indicating the salient features. (10 Marks)
b. The sewage of a town is to be discharged into a river. The quantity of sewage produced per day is 8 million liters and its BOD is 250 mg/C. If the discharge in the river is 200 f/s and if its BOD is 6mg/C, find the B.O.D of the diluted water. (06 Marks)

Module 3

- 5 a. Write the flow diagram employed to treat municipal waste water and indicate the importance of each treatment unit. (08 Marks)
b. With a neat sketch, explain the working of a grit chamber and skimming tank. (08 Marks)

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OR

- 6 a. Explain with a neat sketch, the working principles of a trickling filter. (08 Marks)
b. Briefly explain the terms : i) Suspended growth ii) Activated sludge
iii) Sludge digester iv) Sequential batch reactors. (08 Marks)

Module-4

- 7 a. Explain the effects of effluent discharge on the stream water quality. (08 Marks)
b. What is meant by strength reduction? Explain the various methods of strength reduction being adopted in the industries. (08 Marks)

OR

- 8 a. List and explain the methods of removal of colloidal solids from wastewater. (08 Marks)
b. Explain the principles of raw and partially treated wastes before discharged into streams. (08 Marks)

Module-5

- 9 a. With the help of a flow diagram, explain the treatment units suggested to treat wastewater from a tanning industry along with wastewater characteristics. (08 Marks)
b. State the sources and characteristics of the wastewater from dairy industry. (08 Marks)

OR

- 10 a. With the help of a line diagram, explain the process of paper and pulp industry highlighting the sources of wastewater generation. (08 Marks)
b. Discuss the characteristics and treatment of waste water from a pharmaceutical industry. (08 Marks)

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the need for Good sanitation. Describe types of sewerage system and their suitability. (10 Marks)
b. Explain factors affecting wet weather flow and the effects of flow variations on the design of sewerage system. (06 Marks)

OR

- 2 a. Define Sewer Appurtenances and explain with neat sketch construction and working of manhole. (06 Marks)
b. What do you understand by the term Low – cost treatment? (02 Marks)
c. Explain the following with sketches :
i) Septic tank ii) Oxidation pond. (08 Marks)

Module-2

- 3 a. Explain briefly the dilution method of disposal of sewage. What are the factors which influence the choice of the method to be adopted? (06 Marks)
b. Design a sewer to serve a population of 36,000, the daily per capita water supply allowance being 135 lt, of which 80%, find its way into the sewer. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the dry weather flow, when running full. What would be the velocity of flow in the sewer when running full? (10 Marks)

OR

- 4 a. Discuss in details the process Deoxygenation and Reoxygenation with respect to self – purification of Natural water with a neat sketch. (08 Marks)
b. Write short notes on :
i) Sewage sickness ii) Sewage farming. (08 Marks)

Module-3

- 5 a. Write the flow diagram employed for a municipal wastewater treatment plant. Indicate the importance of each unit indicated in the flow diagram. (10 Marks)
b. Explain the importance of screens and types of screens in the sewage treatment process. (06 Marks)

OR

- 6 a. Determine the size of the High rate Tricking Filters for the following data :
i) Sewage flow = 4.5 MLD ii) Recirculation ratio = 1.5
iii) BOD of Raw sewage = 250 mg/L iv) BOD removal in primary tank = 30%.
v) Final effluent BOD desired = 30 mg/L. (08 Marks)
b. Explain briefly the different stages of sludge digestion process in a “Digester”. With a neat sketch, explain the constructional details of sludge digestion tank. (08 Marks)

Module-4

- 7 a. Differentiate between Domestic sewage and Industrial waste. (08 Marks)
b. Explain the methods used for Neutralization of Acidic and Alkaline waste. (08 Marks)

OR

- 8 a. Briefly explain the effects of Industrial wastewater on sewage treatment plants. (08 Marks)
b. Explain different methods of Strength Reduction. (08 Marks)

Module-5

- 9 a. With process flow diagram, explain the cotton textile mill wastes origin. (08 Marks)
b. Enumerate the effects of discharging paper and pulp industrial wastes into water bodies or sewers. (08 Marks)

OR

- 10 a. With process flow diagram, explain the origin of wastes from Cane Sugar mill. List its characteristics. (08 Marks)
b. With a flow diagram, explain the units used for treatment of Dairy waste on receiving stream. (08 Marks)