

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Water And Wastewater Engineering

Subject Code : 4TE06WWE1

Branch: B.Tech (Civil)

Semester : 6

Date: 29/04/2019

Time: 10:30 To 01:30

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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- Q-1 Attempt the following questions: (14)
- a) Which of these is an example of wastewater recycling: (01)
- a. Discharge of treated sewage to agricultural fields
 - b. Discharge of untreated sewage to a river
 - c. Discharge of treated sewage to a river
 - d. None of the above
- b) Which of the following statements is true about pollutants and contaminants? (01)
- a. Both pollutant and contaminant always have harmful effects on the surroundings.
 - b. A pollutant always has harmful effects on the surroundings while a contaminant may or may not have the same.
 - c. A pollutant may be a component of the system while a contaminant is usually introduced from the outside.
 - d. Both b and c
- c) Which one of the following method gives the better estimate of population growth of an area with limited resources for future expansion: (01)
- a. Geometric increase method
 - b. Arithmetic increase method
 - c. Incremental increase method
 - d. Logistic growth method
- d) There are two wastewater samples of same composition namely A and B. Sample A has a temperature of 20⁰C and sample B has a temperature of 30⁰C. Which sample can be assumed to have more Dissolved Oxygen? (01)
- a. Sample A
 - b. Sample B
 - c. Both have the same amount of DO
 - d. Data insufficient
- e) For a river receiving wastewater stream, the DO levels drops to minimum in: (01)
- a. Clean zone
 - b. Decomposition zone
 - c. Septic zone
 - d. Recovery zone



- f) The ratio of the design discharge to the surface area of a sedimentation tank is known as its: (01)
- Surface loading
 - Overflow velocity
 - Overflow rate
 - All of these
- g) Which of the following types of settling phenomenon can be analysed by the classic sedimentation laws of Newton and Stokes? (01)
- Discrete settling
 - Flocculent settling
 - Hindered settling
 - Compression settling
- h) Provision of an equalization tank helps in: (01)
- Balancing fluctuating flows
 - Balancing fluctuating concentrations
 - promoting self-neutralization
 - All of the above
- i) Which one of the following bioreactor configurations is the basis for a Trickling Filter? (a) (01)
- Stirred tank suspended growth
 - Packed bed attached growth
 - Fluidized bed attached growth
 - Fluidized bed suspended growth
- j) Which of the following determines the settling characteristics of sludge? (01)
- Solid Retention Time (SRT)
 - Food to microorganism (F/M) ratio
 - Sludge Volume Index (SVI)
 - Organic Loading Rate (OLR)
- k) Performance of Activated Sludge Process depends on (01)
- BOD loading
 - F/M ratio
 - Aeration period
 - All of these
- l) In a Rotating Biological Contractor: (01)
- Water is passed through the packed bed media
 - Packed bed media is passed through the water
 - Both water and media rotate in countercurrent directions
 - None of the above
- m) ASP and RCB are typical examples of: (01)
- Aerobic treatment of wastewater
 - Anaerobic treatment of wastewater
 - Both, a and b
 - Neither a nor b
- n) The most important type of species involved in the degradation of organic matter in the case of Biological Treatment Processes is (01)
- Photoautotrophs
 - Chemoheterotrophs
 - Photo-heterotrophs
 - Chemo-autotrophs

Attempt any four questions from Q-2 to Q-8

Q-2

Attempt all questions

(14)



- (a) Describe design period of water supply project along with factors affecting it. What should be the design period of distribution system as recommended by GOI? (07)
- (b) The following data have been noted from the census department of a city of moderate size and age. Estimate the probable population for the year 2010, 2025 and 2040 (07)

Year	Population
1961	6848
1971	13308
1981	36747
1991	58242
2001	82149

- Q-3 Attempt all questions (14)
- (a) Enlist the methods of Population forecasting. (03)
- (b) Explain Logistic Growth Method (04)
- (c) Describe various types of water carriage system in brief with advantages and disadvantages. (07)
- Q-4 Attempt all questions (14)
- (a) What is Discrete particle? Find the settling velocity of discrete particle in water, having particle diameter $d=4 \times 10^{-3}$ cm and specific gravity 2.65. Assume Reynold's number less than 0.5. Water temperature 20°C . and kinematic viscosity of water at 20°C is 1.01×10^{-2} cm^2/s (07)
- (b) Enlist types of Pipe Network. Describe any two in detail. (07)
- Q-5 Attempt all questions (14)
- (a) Explain design criteria of the Grit Chamber. (07)
- (b) Design the coagulation cum sedimentation tank for the water work supplying water to a town having population of 1.20 lac and demand of 135 litre/capita/day. The maximum demand may be taken as 1.5 times the average demand. Assume detention period of 5 hours and 30 minutes for settling tank and floc chamber respectively. Assume the flow rate as 950 $\text{lit}/\text{hour}/\text{m}^2/\text{s}$ of plan area. (07)
- Q-6 Attempt all questions (14)
- (a) Explain in "Water Carriage System of Sanitation" in detail.
- (b) Differentiate self-cleaning velocity and limiting velocity in sewers. Design a circular sewer, running half full, to carry waste water at a velocity of 1.5 m/s with a slope of 1 in 500. Take manning's n as 0.012.
- Q-7 Attempt all questions (14)
- (a) Explain sludge digestion and its stages. Also describe factors affecting sludge digestion. (07)
- (b) Discuss the low cost sanitation system and design a septic tank with soak pit for 200 users. Take loading of 150 litre/capita/day for septic tank and percolation rate of 1250 $\text{lit}/\text{m}^3/\text{day}$ for soak pit. Assume suitable data if required. (07)
- Q-8 Attempt all questions (14)
- (a) Differentiate between (07)
1. Activated sludge and Trickling filter
 2. Attached growth process and Suspended growth process
- (b) How unit operations differ with unit process? Design a rectangular grit chamber for 6 MLD of sewage. (07)

