Total No. of Questions : 4]

SEAT No. :

**PA-10031**

[Total No. of Pages : 3

## [6009]-313

## T.E. (Civil)(Insem)

## WASTE WATER ENGINEERING

## (2019 Pattern) (301012) (Semester - II)

*Time : 1 Hour]* *[Max. Marks : 30*

*Instructions to the candidates :*

1) *Answer Q1 or 2, Q3 or 4.*
2) *Figures to the right indicate full marks.*
3) *Draw neat figures wherever necessary.*
4) *Assume suitable data, if necessary.*
5) *Use of scientific calculator is allowed.*

***Q1)*** a) Differentiate between centralized and decentralized sanitation infrastructure. **[3]**

b) Estimate the total quantity of a sewage of a town with population 50000. The water supply rate is 150 l/c/d of which 80% finds its way into the sewer. The estimated infiltration of ground water is 8000 1/km line per day. The proposed sewerage system will have 65 km of sewer line, out of which nearly 50% will be below ground water table. **[6]**

c) The BOD of sewage incubated for 5 day at 30ºC has been found to be 150 mg/1. What will be 5 day BOD at 20ºC. Assume $k_d = 0.12\ d^{-1}$ at 20ºC. **[6]**

OR

***Q2)*** a) Define and explain self-cleansing and non-scouring velocity. **[3]**

b) Design a sewer to serve a population of 36,000; the daily per capita water supply being 135 litres, of which 80% finds 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 the flow in the sewer when running full? Take N = 0.012. **[6]**

*P.T.O.*

c) If $BOD_5$ of a sample measured at 20ºC is 250 mg/L, determine 3-day BOD at 27ºC. Assume a reaction rate constant = 0.23 $d^{-1}$ (to the base e) at 20ºC. **[6]**

*Q3)* a) Explain various treatment units in primary treatment of waste water. **[3]**

b) Determine the dimensions and detention period of a rectangular grit chamber for following data. **[6]**

Maximum Flow of sewage = 20MLD

Specific gravity of grit = 2.65

Diameter of grit particle to be removed = 0.2 mm and above

Average temperature = 20ºC

Flow through velocity = 0.23 m/sec

Width of grit chamber = 1.2 m

Freeboard = 0.3 m

Space of the sludge accumulation = 0.25 m

c) A circular sedimentation tank is to be designed using following data. **[6]**

Sewage flow = 10 MLD, design size of suspended particles to be removed = 0.06 mm, specific gravity of solids = 1.2, kinematic viscosity of sewage at 10ºC = $1.14 \times 10^{-6}$ $m^2/s$, desired efficiency for removal of the particles of given size and above = 65%, constant for performance of basin, n = ¼, detention time = 2.4 hrs. Determine i) Required surface overflow rate ii) Dimensions of sedimentation tank, weir overflow rate.

OR

*Q4)* a) Explain the importance of grit chamber. **[3]**

b) Design a grit chamber consisting two channels, each of 1.0 m wide for following data. **[6]**

Average sewage flow = 11800 $m^3$/d, Max. flow = 2(Average flow), Design size of grit particles to be removed = 0.2 1mm, Sp.gr. = 2.65, Average temperature = 10ºC Desired efficiency for removal of particles of given size and above = 75%, constant for performance of the basin (n) = 1/8, detention time = 60 seconds. Determine the flow through velocity.

c) Design a rectangular sedimentation tank for a town having population of 130,000. The average sewage generation rate is 150 lpcd. Surface loading rate is $50 m^3/d/m^2$, detention period is 2 hrs and length to width ratio 2:1. **[6]**

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