

Total No. of Questions : 6]

SEAT No. :

P5101

[Total No. of Pages : 3

BE/Insem.-501
B.E. (Civil)
Environmental Engineering - II
(2012 Pattern) (Semester - I)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:-

- 1) *Attempt Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6. Figures to the right indicates full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Assume any missing data if necessary.*
- 4) *Use of scientific calculators is allowed.*

- Q1)** a) Explain the variation in sewage flow. How the variation in sewage flow is taken into account while designing the sewer. **[2+2]**
- b) What are the different sources of domestic sewage? Hence explain the method of estimating sewage discharge. **[3+3]**

OR

- Q2)** a) Explain the significance of maximum and minimum velocities to be generated in the sewer with suitable examples. **[4]**
- b) State and explain the rational formula for estimating storm water flow. **[2]**
- c) Design a circular sewer for conveyance 5 MLD of sewage flow. The sewer should be designed to carry maximum discharge while running half full. A velocity of 1.0 - 1.5m/s should be generated at maximum flow. Use following data. **[4]**
- i) Max. flow/Ave.flow = 3;
 - ii) Manning's constant = 0.013.

- Q3)** a) Explain the principle and working of grit chamber. Also explain the need of velocity control devices in grit chamber. **[2+2]**
- b) Explain various zones of pollution for a polluted river undergoing self purification. **[4]**

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- c) Determine BOD of river water on downstream of point of sewage disposal using following data. [2]
- i) Sewage flow = 5 MLD,
 - ii) BOD of sewage = 240 mg/L ,
 - iii) Discharge in river = 20 MLD and
 - iv) BOD of river water on upstream of point of disposal = 5mg/L.

OR

- Q4)** a) What is DO deficit? Hence explain the Oxygen Sag curve. [2+2]
- b) The 5day BOD of a wastewater sample at 20°C was found to be 400 mg/L. Determine the ultimate BOD and 3day BOD at 30°C. Take $K_d=0.1/d$ at 20°C. [6]

- Q5)** a) Explain the principle and working of Activated Sludge Process with suitable flow chart. [2+2]
- b) Design a high rate single stage trickling filter for treating domestic sewage flow of 8 MLD using N.R.C. formula. Use following data. [6]
- i) BOD₅ of raw sewage = 240 mg/L,
 - ii) BOD removed during primary treatment = 30%,
 - iii) Organic loading rate = 0.8Kg/m³/d,
 - iv) Hydraulic loading rate =15 m³/m³/d,
 - v) Recirculation ratio = 2.

Determine,

- 1) Volume of filter media
- 2) Dimensions of trickling filter
- 3) Efficiency of trickling filter

OR

- Q6)** a) Explain the principle and working of trickling filter with suitable flow chart. [2+2]

b) Design a completely mixed activated sludge process for treating domestic sewage flow of 8 MLD. Use following data. [6]

- i) BOD₅ of raw sewage = 240 mg/L,
- ii) BOD removed during primary treatment = 30%.
- iii) Permissible effluent BOD = 30mg/L.
- iv) MLSS = 3000mg/L,
- v) Return sludge solids concentration = 10000mg/l,
- vi) Ratio of VSS/SS = 0.8,
- vii) Kinetic constants : $Y = 0.5$, $K_d = 0.05$.
- viii) Mean Cell Residence Time (MCRT) = 10 days
- ix) Oxygen transfer capacity for aerators under field condition = 1.6 Kg/KWh

Determine,

- 1) Volume of aeration tank
- 2) Rate of sludge wasting and sludge recirculation ratio
- 3) Oxygen and power requirement

