

Total No. of Questions : 6]

SEAT No. :

P5788

[Total No. of Pages : 3

B.E./Insem/Oct.-501

B.E. (Civil)

ENVIRONMENTAL ENGINEERING - II

(2015 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Solve Q. No.1 or Q. No.2, Q. No.3 or Q. No.4, Q. No.5 or Q. No.6.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Use of logarithmic table, slide rule and electronic pocket calculator are allowed.*
- 5) *Assume suitable data if necessary, stating it clearly.*

- Q1)** a) What factors are considered while estimating sewage flow? Determine the domestic sewage flow generated from a town using following data, Population: 80000 and rate of water supply: 150 lpcd. **[2+2]**
- b) Determine the storm water flow from a catchment of 50 hectares. It consist of different sub-catchments as given in table below. The critical intensity of rainfall in the area is 18mm in 24 hours. **[4]**

Type of sub-catchment	% of total catchment	Impermeability coefficient (i.e., Coefficient of runoff)
i. Water tight roof area	30	0.95
ii. Road pavement	15	0.85
iii. WBM road	10	0.55
iv. Gardens	5	0.2
v. Agriculture area	40	0.1

- c) What is self purification of a polluted river? **[2]**

OR

P.T.O.

- Q2) a)** What is the significance of minimum velocity of sewage flow in the sewers? Calculate the minimum velocity and gradient required to carry inorganic coarse particles of 1.2mm through a sewer of 0.9m diameter. Assume sewer running half full. Take Sp.gr. = 2.65, constants: $\beta=0.04$ and $f=0.03$ [2+4]
- b) Explain the different zones of pollution for a river undergoing self purification. [4]

- Q3) a)** Design a grit chamber consisting two channels, each of 1.2m wide for following data. [6]

Ave. sewage flow : 10MLD, Max.flow=1.5(Ave.flow), Design size of grit particles to be removed=0.18mm, Sp.gr.of grit=2.65, kinematic viscosity of sewage at 10°C=1.14 × 10⁻⁶m²/s, Desired efficiency for removal of particles of given size and above=80%, constant for performance of the basin (n) =1/4, detention time=60 seconds. Draw a sketch of the designed details.

- b) Define BOD and COD. Differentiate between BOD & COD [4]

OR

- Q4) a)** What is DO deficit? Explain the Oxygen Sag curve. [4]

- b) A circular sedimentation tank is to be designed using following data. Sewage flow=10MLD, Design size of suspended particles to be removed=0.06 mm, Sp.gr. solids=1.2, kinematic viscosity of sewage at 10°C=1.14 × 10⁻⁶m²/s, Desired efficiency for removal of particles of given size and above=65%, constant for performance of the basin (n)=1/4. Draw a sketch of the designed details. [6]

Detention time = 2.5hours. Determine,

- i) Required surface overflow rate,
- ii) Dimensions of sedimentation tank,
- iii) Wier overflow rate

Q5) a) Explain the principle and working of Activated Sludge Process with suitable flow chart. [4]

b) Design a high rate single stage trickling filter for treating domestic sewage flow of 12 MLD using N.R.C. formula. Use following data. [6]

- i) BOD_5 of raw sewage=300mg/L,
- ii) BOD removed during primary treatment=30%,
- iii) Organic loading rate=0.8Kg/m³/d,
- iv) Hydraulic loading rate=15m³/m²/d,
- v) Recirculation ratio=2.

Determine,

- I) Volume of filter media
- II) Dimensions of trickling filter
- III) Efficiency of trickling filter

OR

Q6) a) Explain the principle and working of trickling filter with suitable flow chart. [4]

b) Design a completely mixed activated sludge process for treating domestic sewage flow of 12 MLD. Use following data. [6]

- i) BOD_5 of raw sewage=300mg/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: $Y=0.5$, $K_d=0.05$, $f=0.68$,
- viii) Mean Cell Residence Time (MCRT)=10 days
- ix) Oxygen transfer capacity for aerators under field condition=1.6 KgO₂/KWh

Determine,

- I) Volume of aeration tank
- II) Sludge recirculation ratio
- III) Oxygen and power requirement

