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 hecters. 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 partials of 1.2mm through a sewer of 0.9m diameter. Assume sewer running half full. Take Sp.gr. = 2.65, constants: β=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 × $10^{-6}m^2/s$, 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 × $10^{-6}m^2/s$, 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/m^3/d,

iv) Hydraulic loading rate=15m^3/m^2/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/1,

vi) Ratio of VSS/SS=0.8,

vii) Kinetic constants: Y=0.5, Kd=0.05, f=0.68,

viii) Mean Cell Residence Time (MCRT)=10 days

ix) Oxygen transfer capacity for aerators under field condition=1.6 KgO_2/KWh

Determine,

I) Volume of aeration tank

II) Sludge recirculation ratio

III) Oxygen and power requirement