53 (CE 602) EVEN

2014

ENVIRONMENTAL ENGG. II

Paper : CE 602

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Write short notes on the following :

$4 \times 3 = 12$

(i) Zone of pollution in a stream

(ii) Sewage sickness

(iii) Skimming tank

(b) A waste water effluent of $560\,litre/sec$ with a $BOD = 50\,mg/l$, $DO = 30\,mg/l$ and temperature of $23°C$ enters a river where the flow is $28\,m^3/sec$, and $BOD = 4\cdot0\,mg/l$, $DO = 8\cdot2\,mg/l$ and temperature of $17°C$. K_1 for waste is $0\cdot10$ per day at $20°C$. The velocity of water in the river downstream is $0\cdot18\,m/sec$ and depth of $1\cdot2m$. Determine the following after mixing of waste water with the river water : (i) combined discharge (ii) BOD (iii) DO (iv) temperature.   8

2. (a) Design an imhoff tank to treat the sewage from a small town with a population of 20,000 persons, with sewage flow rate of 180 litre per day.   15

   (b) What do you understand by Stabilisation pond and classify them.   5

3. (a) Enumerate various treatment techniques used for biological treatment.   6

(b) Explain with the help of neat diagram the working of an oxidation pond.   6

(c) An average operating data for conventional activated sludge treatment plant is as follows :   8

ww flow $= 50,000 \, m^3/d$

Volume of aeration tank $= 15500 m^3$

Influent $BOD = 200 \, mg/l$ Effluent $BOD = 25 \, mg/l$

Mixed liquor suspended solids (MLSS) $= 3000 \, mg/l$

effluent $SS = 40 \, mg/l$

Waste sludge $SS = 12000 \, mg/l$

Quantity of waste sludge $= 250 \, m^3/day$

Determine :

    (i) Aeration period (hours)

    (ii) Food to micro organisms Ratio (F/M) (*kg BOD* per *day/kg* MLSS)

    (iii) Percentage efficiency of *BOD* removal

    (iv) Sludge age (days)

4. (a) What do you understand by oxygen sag curve ? Derive the classic Streeter Phelps oxygen sag equation. 10

(b) What do you understand by activated sludge process ? Explain with the help of a flow diagram, the essentials of activated sludge process. 6

(c) Design a septic tank for the following data : 4

No. of persons = 100,

sewage/capita/day = 120 *litre*

Desludging period = 1 year.

5. (a) Explain with the help of flow diagram various operations/processes employed in conventional waste water treatment. 5

(b) A town discharges 80 *cumecs* of sewage into a stream having a rate of flow of 1200 *cumecs* during lean days at a 5 day BOD of sewage at the given temperature as $250 \, mg/l$. Find the amount of critical DO deficit and its location in the downstream. Assume deoxygenation coefficient K as 0·1 and

coefficient of self purification (f_s) as 3·5. Assume saturation DO at given temperature as $9·2\,mg/l$. Assume $V = 0·12\,m/sec$. 6

(c) Design a detritus tank for a DWF of 350 LPS in a separate sewage system, make suitable assumptions wherever required. 5

(d) Explain the construction and working of intermittent sand filters. 4

6. (a) What do you understand by a trickling filter? Explain with the help of a sketch, the biological process involved in working of a trickling filter. 7

(b) Explain in brief various methods used for aeration. 7

(c) What is the objective of the Biological treatment of waste water? 2

(d) Explain Ridge and furrow type aeration tank. 4

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