

Printed Pages : 7



EEV801

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 197801**

Roll No.

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**B. Tech.**

(SEM. VIII) THEORY EXAMINATION, 2014-15  
**DESIGN OF WASTE WATER SYSTEMS**

Time : 3 Hours]

[Total Marks : 100

**Note:** Attempt all the Question

Assume essential data if required As per Range &amp; Standard

1 Attempt any four Question (4×5=20)

- (a) Define COD? Discuss advantage of COD Test?
- (b) A sample of wastewater has 5 –day 20C BOD value is 70 % of the final. Find the rate constant per day?
- (c) The following BOD result were obtained on a sample of untreated wastewater at 20C

t(day)	0	1	2	3	4	5
Y(mg/I)	0	60	100	140	160	180

Estimate

- (i) Ultimate BOD
- (d) Difference between Zero order and First order reaction?
- (e) Discuss types-1 of settling in brief?
- (f) What is Theoretical Oxygen demand? Estimate ThOD Demand for Propanal ( $C_3 H_7 OH$ )?

2 Attempt any Two Question (2×10=20)

(a) Define following terms (2+2+2+2+2)

(b) (i) Sludge age

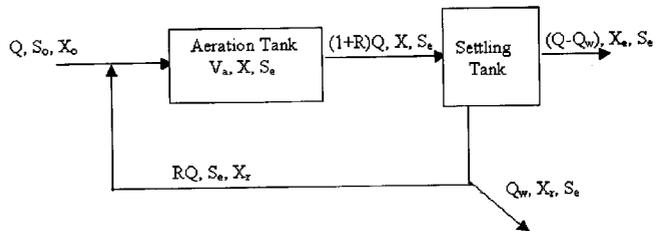
(ii) SRT/MCRT

(iii) F/M ratio

(iv) Significance SVI

(v) Impact of temperature on reaction rate coefficient

- (b) Describe process Microbiology of Activated Sludge Process? Write down Mass Balance equation for Food & Microorganisms in the Entire System? Derive the relationship for MCRT & MLSS



- (c) An Activated sludge system is to be used for secondary treatment of 10000 m<sup>3</sup>/day of municipal wastewater. After primary clarification the BOD is 150mg/l and it is desired to have not more than 5 mg/l of soluble BOD in the effluent. A completely mixed reactor is to be used Assume MLSS=3000 mg/l and Underflow concentration 10000 mg/l  $Y=0.5$ ,  $k_d = 0.05 \text{ d}^{-1}$

Estimate

(3+3+4)

- (i) Volume of reactor
- (ii) The mass and volume of solid that must be wasted each day
- (iii) Recycle ratio
- (d) A pond is located at 23 N if sky clearance factor at the pond location is 75%. And Oxygen production is 1.3 times Algal production

Latitude (deg ree North)	Visible Radiation (Maximum)	VisibleRadiation (Minimum)
50	26	7
40	66	24
30	126	70
20	182	120
10	225	162

Estimate

- (i) Average algal production
- (ii) Average Oxygen production

(e) Prove that

$$S/S_0 = 1/(1+k\theta)$$

Where

$S/S_0$  = Fraction of Soluble BOD remaining

$k$  = rate coefficient ( $d^{-1}$ )  $\theta$  = HRT

$V$  = Reactor Volume  $Q$  = Flow Rate

(f) Short Notes (3+2)

(i) Various types of oxidation ditch

(ii) List various constituents of wastewater

3 Attempt any Two Question (2×10=20)

(a) Distinguish between (With Neat Diagram) (4+3+3=10)

(i) Attached growth process & Suspended growth process With Examples?

(ii) Differences between Unit operation and Unit process with examples?

(iii) Classification of Bacteria on the basis of Carbon and energy sources (With Example)

(b) (i) Design a low rate filter to treat 6.0 Mld of sewage of BOD of 210 mg/l. The final effluent should be 30 mg/l and organic loading rate is 320 g/m<sup>3</sup>/d.

(ii) Advantage of High rate trickling filter?

- (c) Short Notes (5+5=10)
- (i) Discuss Working Principle of RBC with neat Diagram
  - (ii) Properties of Filter media Used in trickling filter
- 4 Attempt any four Question (4×5=20)
- (a) List various factors affecting Oxygen transfer?
  - (b) List various types of aerators? Also draw neat diagram of Floating type vertical axis aerator?
  - (c) Discuss various type of Oxidation Ditch in detail?
- 5 Attempt Any four Question (4×5=20)
- (a) A sedimentation tanks treats 6MLD containing 250mg/l suspended solid. The tanks remove 60% of the suspended solids. Compute the weight and volume of the sludge produced daily if the moisture content of sludge is 95%?
  - (b) Draw Flow chart of Sludge treatment and disposal ?

- (c) Discuss Sludge Characteristics (3+2)
- (i) Sludge from PST
  - (ii) Sludge from the trickling Filter
- (d) What do you understand by "Digestion of Sludge"?  
Discuss Importance of digestion ?
- (e) List various Dewatering Techniques used in sludge disposal ?
- (f) Shorts Notes (3+2)
- (a) Sludge conditioning
  - (b) Sludge drying bed
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