Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2161304 **Date: 01/05/2017**

Subject Name: Biological Processes for Wastewater Treatment

Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

MARKS

Q.1 **Short Questions** **14**

1 In COD test, _____ is used as oxidizing agent. (a)Potassium dichromate b) Sulphuric acid c) Mercuric sulphate d) None of these

2 Standard BOD means _____
a) BOD measures after 7 days at 27°C b) BOD measures after 1 days at 25°C c) BOD measures after 5 days at 20°C d) None of these

3 Hydraulic loading rate for low rate trickling filters is _____m3 /d/m^2.
(a) 0.5 to 2 b) 1 to 4 c) 2 to 5 d) 5 to 8 5.

4 Lower F/M ratioin a conventional ASP will mean _____
a) Lower BOD removal b) Higher BOD removal c) No effect on BOD removal d) None of these

5 The term sludge age is associated with _____
(a)Aeration b) Sedimentation c) Trickling filter d) None of these

6 In trickling filters, slime layer formed is aerobic up to depth of _____mm.
(a) 0.1 to 0.2 b) 0.5 to 0.6 c) 0.01 to 0.02 d) 0.9 to 1.0

7 Effluent obtained from low trickling filter is highly _____.
a) Nitrified b) Stabilised c) Both a) and b) d) None of these

8 Under drainage system is provided in trickling filters, to _____.
(a)Carry away liquid effluent b) To carry away sloughed biological solids c) To distribute air through the bed d) All of above

9 Sewage in the aeration tank is referred as _____.
(a)Black liquor b) Brown liquor c) Mixed liquor d) Sweet liquor

10 Rotating biological contactor is _____ process.
(a) Suspended growth b) Attached growth c) Dual growth d) None of these

11 In ASP, contact stabilization is also known as _____.
(a)Biosorption b) Adsorption c) Absorption d) Chemisorption

12 _____ is a essentially an extended aeration activated sludge process.
(a)Oxidation ditch b) Oxidation pond c) Aerated lagoon d) None of these

13 Oxidation pond is type of _____ pond.
(a)aerobic b) anaerobic c) facultative d) none of these

14 _____ is observed in oxidation ponds.
(a)Bacteria-algal symbiosis b) COD - BOD symbiosis c) Algae-protozoa symbiosis d) None of these

Q.2	**(a)**	Define the objective of biological treatment.	**03**
	(b)	Differentiate between: suspended growth process & attached growth process.	**04**
	(c)	Write down the mass balance for CFSTR with recycle and hence derive the equation for finding biokinetic constant.	**07**
		OR	
	(c)	Draw the BOD progressive curve and explain different phases of the same.	**07**
Q.3	**(a)**	Define the terms: (1) F/M Ratio (2) MCRT (3) organic volumetric loading rate.	**03**
	(b)	Differentiate between: step aeration and tapered aeration in ASP.	**04**
	(c)	What is meant by activated sludge? Describe with sketches the treatment of waste water by activated sludge process. Mention the advantages and disadvantages of this system.	**07**
		OR	
Q.3	**(a)**	Discuss the problems of bulking and foaming of sludge in ASP.	**03**
	(b)	Differentiate between Oxidation pond & Oxidation Ditch.	**04**
	(c)	Explain with a neat sketch the working of a percolating filter (trickling filter). Also explain on which principle it works.	**07**
Q.4	**(a)**	Distinguish between aerobic, anaerobic & facultative microorganism and their role I n decomposition of organic matter.	**03**
	(b)	The BOD_5 of a waste has been measured as 600 mg/l. if k_1=0.23/day(base e),what is the ultimate BODu of the waste. what proportion of the BODu would remain unoxidised after 20 days.	**04**

(c) Laboratory test reactors have been operated at different MCRT values to obtain biokinetic constant for wastewater. the reactants are complete mixed and aerated with clarifier. The value of Θ in all the cases is 0.167 days and Θ_c values were changed. The effluent and influent, soluble COD and reactor MLSS concentrations are as given below. **07**

Test no.	Θ_c days	S_0 mg/Las COD	Se mg/L as COD	X mg/L
1	3.1	400	10	3950
2	2.1	400	14.3	2865
3	1.6	400	21	2100
4	0.8	400	49.5	1050
5	0.6	400	101.6	660

From this data determine the values for biokinetic constant K,KS,Y, Kd,μm

OR

Q.4 **(a)** Define : (1) Substrate utilization rate **03**
(2) specific growth rate
(3) biomass yield

(b) The BOD of a sewage incubated for one day at 30 ^{0}C has been found to be 110 mg/l. what will be the 5-day 20 ^{0}C BOD? Assume K1=0.1 at20 ^{0}C **04**

(c) Determine the value of co-efficient K,KS,Y, Kd,μm from following data. derived banch scale, activated sludge study using CFSTR without recycle. **07**

Unit no.	S_0 BOD_5 mg/l	Se mg/l	$\Theta = \Theta_c$ d	X mg/l
1	300	7	3.2	128
2	300	13	2.0	125
3	300	18	1.6	133
4	300	30	1.1	129
5	300	41	1.1	121

Q.5 **(a)** Explain when anaerobic conditions are developed in a trickling filter. **03**

(b) Discuss the fundamental mechanism of anaerobic digestion. **04**

(c) Discuss the mechanism of working of UASB with neat sketch. **07**

OR

Q.5 **(a)** Write down the applications of RBC. **03**

(b) Discuss the fundamental consideration in the application of natural treatment system. **04**

(c) Enlist the different types of natural treatment system & describe any two. **07**

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