ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END SEMESTER EXAMINATION** (Academic Session: 2020 – 21)		
Name of the Program:	M. Tech. – Environmental Engineering	**Semester:**	II
Paper Title:	Biological Process for Environmental Engineering	**Paper Code:**	ENV21010
Maximum Marks:	50	**Time Duration:**	3 Hrs
Total No. of Questions:	17	**Total No of Pages:**	3
(Any other information for the student may be mentioned here)	**1.** At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. **2.** All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. **3.** Assumptions made if any, should be stated clearly at the beginning of your answer.		

Group A **Answer All the Questions (5 x 1 = 5)**			
1	Define substrates.	**R**	**CO1**
2	Name the building block of protein?	**R**	**CO2**
3	What is sloughing?	**R**	**CO3**
4	What are the two main process of biological nutrient removal?	**U**	**CO4**
5	Define sludge age.	**R**	**CO2**
Group B **Answer All the Questions (5 x 2 = 10)**			
6 a)	Differentiate between anabolism and catabolism process.	**Analyze**	**CO1**
(OR)			
6 b)	Explain any one type of Eukaryotes.	**U**	**CO1**
7 a)	What do you understand by aerated lagoons?	**U**	**CO2**
(OR)			
7 b)	Mention the drawbacks of mechanical aeration units.	**R**	**CO2**
8 a)	Briefly explain the importance of recirculation process in the trickling filter.	**U**	**CO3**
(OR)			
8 b)	Jot down the benefits of high rate filters.	**U**	**CO3**
9 a)	What are main objectives of sludge treatment?	**R**	**CO4**
(OR)			
9 b)	How phosphorous removal can be achieved?	**Analyze**	**CO4**
10 a)	Illustrate the basic difference between attached growth process and suspended growth process.	**Analyze**	**CO3**
(OR)			
10 b)	What is the function of distribution system in trickling filter?	**R**	**CO3**
Group C **Answer All the Questions (7 x 5 = 35)**			
11 a)	Explain the various microbial growth phase.	**U**	**CO1**
(OR)			
11 b)	Differentiate the batch and continuous growth culture of microorganisms.	**Analyze**	**CO1**

12 a)	Compare the fine bubble and coarse bubble aerators of diffused air aeration units.	**Analyze**	**CO2**
	(OR)		
12 b)	Explain the complete mechanism of activated sludge process with the help of a diagram	**Analyze**	**CO2**
13 a)	Design a standard rate trickling filter without recirculation for the following data: i. Sewage flow = 4 MLD ii. BOD of raw sewage = 260 mg/l iii. BOD removal in the primary clarifier = 30% iv. Final effluent BOD desired = 20 mg/l	**Create**	**CO3**
	(OR)		
13 b)	Calculate the effluent BOD_5 of a two stage trickling filter with the following data given: [Q = 4500 m^3/day BOD_5 = 290 mg/l Volume of primary filter = 830 m^3 Volume of secondary filter = 830 m^3 Filter depth = 2 m Recirculation ratio for primary filter = 125 percent Q Recirculation ratio for secondary filter = 100 percent Q Use NRC formula].	**Apply**	**CO3**
14 a)	Explain in detail about the biological nitrogen removal process.	**U**	**CO4**
	(OR)		
14 b)	Explain the various ways by which the sludge disposal can be achieved.	**U**	**CO4**
15 a)	A sedimentation tank treats 8 MLD containing 240 mg/l of suspended solids. The tank removes 65% of the suspended solids. Compute the weight and volume of the sludge produced yearly if the moisture content is (a) 97% and (b) 94%.	**Apply**	**CO4**
	(OR)		
15 b)	A waste water plant produces 1200 kg of dry solids per day at a moisture content of 95%. The solids are 70% volatile with a specific gravity of 1.05 and 30% non-volatile with a specific gravity of 2.5. Determine the sludge volume a) As produced b) After digestion which reduces the volatile solid content by 50% and decreases the moisture content to 90%	**Apply**	**CO4**
16 a)	Explain the domain Bacteria with the help of a diagram.	**U**	**CO1**
	(OR)		
16 b)	What are the various nutritional requirements of microbes? Explain their functions.	**U**	**CO1**
17 a)	Design a secondary clarifier for an activated sludge treatment plant having a MLSS concentration of 3000 mg/l and an average flow rate of 9000 m^3/day.	**Create**	**CO2**
	(OR)		
17 b)	An average operating data for conventional activated sludge treatment plant is as follows: [Wastewater flow = 35000 m^3/day Volume of aeration tank = 10900 m^3 Influent BOD = 250 mg/l Effluent BOD = 20 mg/l Mixed Liquor Suspended Solids (MLSS) = 2500 mg/l Effluent suspended solids = 9700 mg/l	**Apply**	**CO2**

	Quantity of waste sludge = 220 m^3/day] Based on the information given above, determine: a) Aeration period (hours) b) F/M ratio (kg BOD per day/ kg MLSS) c) Percentage efficiency of BOD removal d) Sludge age (days).		