

Name :  
Reg No :

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**07 THRISSUR CLUSTER**

**SECOND SEMESTER M.TECH. DEGREE EXAMINATION APRIL 2018**  
**Civil Engineering**  
**(Environmental Engineering)**

**07CE 6102 BIOLOGICAL METHODS IN ENVIRONMENTAL  
ENGINEERING**

**Time : 3 hours**

**Max.Marks: 60**

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

<b>Q.no.</b>	<b>Module 1</b>	<b>Marks</b>
<b>1a</b>	Explain bacterial growth and reproduction with the help of a neat diagram.	<b>4</b>
	<b>Answer b or c</b>	
<b>b</b>	Write a note on major types of micro-organisms involved in the biological waste water treatment processes.	<b>5</b>
<b>c</b>	Explain the steps in chemo-heterotrophic bacterial oxidation with the help of stoichiometric representation.	<b>5</b>
<b>Q.no.</b>	<b>Module 2</b>	<b>Marks</b>
<b>2a</b>	Explain specific substrate utilization rate and derive the relation between specific substrate utilization rate and mean cell residence time for a CFSTR	<b>4</b>
		<b>5</b>
<b>b</b>	Derive an expression for net specific growth rate of micro-organism.	
<b>c</b>	How will you determine the kinetic coefficients from the data containing a range of effluent substrate concentrations?	<b>5</b>
<b>Q.no.</b>	<b>Module 3</b>	<b>Marks</b>
<b>3a</b>	What are the different types of reactors and also explain the factors affecting the selection of a reactor?	<b>4</b>

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|----------|---|----------|
| <b>b</b> | Write a note on any four types of process modifications of plug-flow model of activated sludge process. | <b>5</b> |
| <b>c</b> | Write a note on nutrient requirements and environmental requirements in activated sludge process.       | <b>5</b> |

Q.no.	Module 4	Marks
<b>4a</b>	Differentiate between Activated sludge process and Trickling filter.	<b>4</b>

**Answer b or c**

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|----------|---|----------|
| <b>b</b> | Explain the significance of NRC equations and the operational troubles of Trickling filter. | <b>5</b> |
| <b>c</b> | Write a note on Sequencing Batch reactor.   | <b>5</b> |

Q.no.	Module 5	Marks
<b>5a</b>	Write a note on sludge thickening and Stabilization.	<b>5</b>

**Answer b or c**

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|----------|--|----------|
| <b>b</b> | Explain different types of solid separation methods used in Stabilization ponds. | <b>7</b> |
|          |  | <b>7</b> |
| <b>c</b> | Differentiate between Aerated lagoon and Stabilization pond.                     |          |

Q.no.	Module 6	Marks
<b>6a</b>	Explain different types of attached growth denitrification systems.	<b>5</b>

**Answer b or c**

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|----------|--|----------|
| <b>b</b> | What do you mean by combined carbon oxidation nitrification process?<br>What are its advantages and disadvantages? | <b>7</b> |
|          |  | <b>7</b> |
| <b>c</b> | What are the effects of major operational and environmental variables on suspended-growth nitrification process?   |          |

