Name :	
Roll No. :	A American (V Consider Int Conference)
Invigilator's Signature :	

## CS/B.Tech (FT)/SEM-5/FT-504/2009-10 2009

## WASTE MANAGEMENT OF FOOD INDUSTRIES

*Time Allotted* : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

## GROUP – A ( Multiple Choice Type Questions )

- 1. Choose the correct alternatives for the following :  $10 \times 1 = 10$ 
  - i) BOD can be measured
    - a) at 20° C for 7 days b) at 27° C for 3 days
    - c) at  $20^{\circ}$  C for 5 days d) both (b) & (c).
  - ii) Biogas can be produced from
    - a) brewery waste
    - b) fruits and vegetables processing waste
    - c) tannery waste
    - d) both (b) & (c).
  - iii) Biofilter can easily treat
    - a) soluble organic effluent
    - b) insoluble organic effluent
    - c) soluble organic gaseous effluent
    - d) insoluble organic gaseous effluent.

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iv)	For shou	the composting of 1ld be around	any orga	anic material C/N ratio		
	a)	20 - 25	b)	25 - 30 - 30		
	c)	30 — 35	d)	35 — 40.		
v)	The com	percentage of m posting is	required for anaerobic			
	a)	30 — 40%	b)	70 — 80%		
	c)	50 - 60%	d)	20 — 30%.		
vi)	Phys	vsical property of trickling filter are				
	a) high surface area to volume ratio, cheap, hig strength and reliability, does not clog easily					
	b)	low surface area strength and reliab	to volu pility, doe	me ratio, costly, high s not clog easily		
	c)	high surface area strength and reliab	a to volu pility, doe	ume ratio, costly, low s not clog easily		
	d)	low surface area strength and reliab	to volu pility, clog	me ratio, costly, high g easily.		
vii)	For than	or metal removal biosorption is more advantageous han chemical precipitation ( State <i>True</i> or <i>False</i> )				
	a)	True	b)	False.		
viii)	For a hold	or a waste water ample which of the following relations olds good ?				
	a)	BOD > COD	b)	BOD < COD		
	c)	BOD = COD	d)	none of these.		
ix)	Degr by	ee of decomposition	n of solid	waste can be measured		
	a)	final drop in temp	erature			
	b)	oxygen uptake rate	e			
	c)	starch-iodine test				
	d)	all of these.				
x)	The indu	type of biological w stry waste depends	vaste trea s mainly o	atment selected for food		

- a) treatment required
- b) volume of waste
- c) concentration of organic matter
- d) capital and operating costs.

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- 2. Briefly discuss the advantages and disadvantages of Anaerobic treatment of liquid waste over Aerobic treatment.
- 3. Describe briefly the major steps involved in activated sludge process. What is active sludge ? 4 + 1
- 4. What are the advantages of catalytic hydrogeneration of solid waste ? Discuss the process in detail.
- 5. Derive the relationship between  $BOD_U \& BOD_5$ .
- 6. Justify Vermicompost as an ideal fertilizer.

## GROUP - C( Long Answer Type Questions )Answer any three of the following. $3 \times 15 = 45$

- 7. Primary sludge containing trickling filter humus in gravity thickened in a circular tank with a diameter of 3.6 and side water depth of 3.0 m. The applied sludge is  $9.8 \text{ m}^3/\text{d}$  with 4.5% solid and thickened sludge withdrawn is  $4.9 \text{ m}^3/\text{d}$  at 7.5%. The blanket of consolidated sludge in the tank has a depth of 1.0 m. For odor control and to enhance thickening,  $170 \text{ m}^3/\text{d}$  of treated wastewater is pumped to the tank along with the sludge to increase the overflow rate calculate the following :
  - i) solids leading on the tank bottom
  - ii) the solid capture
  - iii) the overflow rate
  - iv) estimated SRT in the tank.

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- 8. a) Explain bio-filtration phenomenon of liquid industrial sewage. What is the controlling mechanism of a bio-filter ?
  - b) How can Ion Exchange Treatment is successfully implemented in Effluent Treatment Technique  $?7\frac{1}{2} + 7\frac{1}{2}$
- 9. What are the different methods for treatment of solid wastes ? What are the advantages and disadvantages of land fill method ? Discuss design aspects of land fill method.

3 + 5 + 7

- 10. What is rotating biological contactors (RBC) ? Discuss the performance and design aspect of RBC and its advantages & disadvantages.
  3 + 8 + 4
- 11. A food processing unit generates 1t of solid waste that needs to be stabilized aerobically. It may be assumed that the initial composition of the biodegradable organic material to be decomposed is  $[C_6H_7O_2(OH)_3]_5$  and the final composition of the residual organic matter is  $[C_6H_7O_2(OH)_3]_2$ . After oxidation process, 40% of the material is available for compost. Estimate the amount of oxygen required to oxidize the waste. In absence of nitrogen in the solid waste calculate the mass balance and find out the unaccounted mass, if any. 10 + 5

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