Reg. No.





VII SEMESTER B.TECH. (BIOTECHNOLOGY)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: SOLID WASTE MANAGEMENT [BIO 4004]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.

1A. A certain community produces the following quantities of solid waste on an annual basis

		Fraction	Tons per year					
		Mixed house waste	250					
		Recyclables	30					
		Commercial waste	50					
		Construction and demolition debris	135		3			
		Leaves and miscellaneous	40					
	Generated recyclables are collected separately and processed at a materials recovery							
	plant. Both mixed household and commercial wastes are taken to the municipality landfill,							
	as do the leaves and miscellaneous solid wastes. The C and D wastes are used to fill a							
	large ravine. Calculate percentage of diversion.							
1B.	Municipal sol	id waste may be defined as a "heterogeneou	s mass of throwaw	ays from the				
	urban community, as well as the more homogeneous accumulations of agricultural,							
	industrial and mineral wastes". Based on this definition, how can you classify urb municipal solid waste? State your reasons.							
1C.	"It is difficult to determine relevance of diseases with waste and garbage. Nonetheless,							
	about 50% of various diseases are transferred by flies, mosquitoes and rodents							
	proliferating in the waste." To prevent the disease outbreaks, what procedures would you							
	advocate, to b	o be followed by concerned authorities?						
1D.	Explain the legal aspects of solid waste management system.							
2A.	Find approxin	nate chemical formula of the organic compone	ent of the sample c	omposition of				
	a solid waste as set out in the following table. Use chemical composition obtained to							
	estimate ener	rgy content of this solid waste.						

	Com	Component		Moisture		(Chemi	ical Cor	npositi	on, Kg		
				Content	C		Н	0	Ν	S	Ash	
	Garden	Irden trimmings 10 60		47	.8	6	38	3.4	0.3	4.5		
	Food	Food Wastes 25		75	4	8	6.4	37.6	2.6	0.4	5	
	Ti	Timber		20	49	.5	6.0	42.7	0.2	0.1	1.5	
	P	Paper		6	43	.5	6	44	0.3	0.2	6	
	Car	Cardboard		5	4	4	5.9	44.6	0.3	0.2	6	
	Ru	ubber	4	2	78	.0	10.0	-	2.0	-	10.0	
	Tin	cans	6	3	4.	5	0.6	4.3	0.1	-	90.5	
2B	The follow	ing table sho	ows the comp	onents and	bul	k den	isity of	a certa	ain solio	d waste	e and	
	garbage.			1								
		Componer	nt	Weight (Ke	Weight (Kg) Apparent density befo			before	•			
					compaction, g/cm ³							
		Yard waste		20 0.071								
		Plastics		10 0.037								
		Newspaper		20 0.099						2		
		Glass		10	0.295						3	
		Food waste		30 0.368								
		Corrugated	d cardboard	10 0.03								
	Assuming compaction in a landfill for the production of apparent density in the field of 700											
	kg/m ³ , find size reduction due to compaction of the solid waste. Find apparent density											
	before com	paction ass	uming total se	eparation of	glas	ss an	d new	spaper	S.			
3A.	A family of	six people	generates s	olid waste	at a	a rate	e of 2	.5 Kg/c	ap/day	and t	he bulk	
	density of r	efuse in a ty	ypical garbag	e can is abo	out	230 k	kg/m³.	If colle	ction is	s once	a week,	
	how many 30-gallon garbage cans will they need, or the alternative, how many compacted							4				
	20-Kg bloc	ks would th	e family prod	luce if they	hac	l a ho	ome c	ompac	tor? Ho	ow ma	ny cans	
	would they need in that case?											
3B.	A truck is for	ound to be a	ble to service	customers	at a	a rate	of 2 c	ustome	ers per	minute	e. If they	
	find that the	e actual time	e they spend	on collectio	on is	5 ho	ours, h	iow ma	ny cus	tomers	can be	3
	served per day?											
3C.	What are the hazardous waste constituents of MSW in an urban residential colony?					2						
	Compare it with that of waste from rural area.						5					

4A.	Describe various methods of collection of municipal solid wastes. What are the common types of vehicles used in collection of MSW?				
4B .	Solid waste is collected from a locality using hauled-container system. The to the collection activities, are as follows: Time taken be the vehicle to reach to 1 st container location from garage Time taken be the vehicle to reach to garage from last container location Average time required to drive the vehicle between consecutive containers Round trip haul distance Time required to pick up loaded container and to unload empty container At site time (per trip) Haul constant coefficient, a b Determine the number of trips of the collection vehicle per day, assuming 8 and off-route factor equal to 0.15.	data pertaining 15 min 20 min 6 min 50 km 24 min 8 min 0.016 h/trip 0.011 h/km hours work day	6		
5A.	Draw a neat sketch of a cross-section of an engineered landfill site. List the components of landfill site.				
5B.	What are the main characteristics of hazardous wastes? Discuss the impact on human health.				
5C.	What are the categories of biomedical wastes? Discuss the method of treatment and disposal for each.				