CLASS: M.Tech   SEMESTER: II
BRANCH: ESE   SESSION: SP/19

SUBJECT: CE534 SOLID WASTE MANAGEMENT

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	Discuss physical characterization of MSW.	[2.5]
Q.1(b)	Explain the factors that affect waste generation rates.	[2.5]
Q.1(c)	Explain briefly the factors that must be considered during onsite storage of solid wastes.	[5]

Q.2(a) Determine, based on operating costs, the break-even points for a hauled and stationary container [5] system as compared with a system using transfer and transport operations for transporting wastes collected from a metropolitan area to a landfill disposal site. Assume the following cost data are applicable. Use graph paper.
Operating costs
   a. Hauled container system using a hoist truck with an 8-yd^3 container = Rs. 25/hour
   b. Stationary container system using a 20-yd^3 compactor = Rs. 40/hour
   c. Tractor semi-trailer transport unit with a capacity of 105 yd^3 = Rs. 40/hour
   d. Transfer station operating cost = Rs. 2.75/yd^3

Q.2(b) Solid waste from a new industrial park is to be collected in large containers (drop boxes), some [5] of which will be used in conjunction with stationary compactors. Based on traffic studies at similar parks, it is estimated that the average time to drive from the garage to the first container location (t_1) and from the last container location (t_2) to the garage each day will be 15 and 20 min, respectively. If the average time required to drive between containers is 6 min and the one-way distance to the disposal site is 15.5 mi (speed limit: 55mi/hr), determine the number of containers that can be emptied per day, based on a 8-h workday. Assume off-route factor W = 0.15. Take pc+uc = 0.4 h/trip; a = 0.016 h/trip; b= 0.018 h/trip; s= 0.133h/trip.

Q.3(a)	Describe briefly the process of Fluidised Bed Combustion (with sketch).	[2.5]
Q.3(b)	List the parameters of MSW on which suitability of RDF as a fuel depends upon. List the unit operations required for converting waste to RDF.	[1+1.5]
Q.3(c)	Develop mathematically the general calculations for recovery and purity of individual components when waste stream is passed through Binary Separators.	[5]

Q.4(a)	Explain the different phases in generation of LFG. Draw a neat sketch illustrating the variations in principal LFG component gases with time.	[5]
Q.4(b)	What are the different types of liner systems given for leachate control in landfills? Discuss 'sloped terraces' and 'piped bottom' leachate collection facilities.	[2.5+2.5]

Q.5(a)	Discuss the waste management approach for Industrial Solid Wastes in general.	[4]
Q.5(b)	List the names of major industrial wastes, their sources and possible areas of application.	[6]

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