BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH. **SEMESTER: IV**
BRANCH: CIVIL ENGINEERING **SESSION: SP/2025**

SUBJECT: CE421 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.

			CO	BL
Q.1(a)	Describe the process of recycling of aluminium and plastics.	[5]	1	1
Q.1(b)	Discuss the concept of integrated solid waste management.	[5]	1	2
Q.2(a)	Solid waste from a commercial area is to be collected using a hauled container system. Available data related to the collection and transportation of waste are: 9-hour working day, the average time to drive from the garage to the first collection spot is 20 minutes, the last collection point to the garage is 20 minutes, the average time needed to drive between containers is 6 minutes, time required to pick up loaded container and time required to empty the container is 0.4 h/trip, s = 0.133, a = 0.05, b – 0.025, W = assume; and one-way distance to the disposal site is 30 km (speed limit: 40 km/h). Based on the above information, estimate the number of trips that can be made per day.	[5]	2	2
Q.2(b)	Review the methods followed for the municipal solid waste collection process.	[5]	2	2
Q.3(a)	Compute the electrical energy output of a steam boiler turbine-generator energy recovery plant running on unprocessed MSW with an energy content of 12,000 kJ/kg produced from a city with 2.0 million population generating waste at a rate of 0.6 kg/capita/day. Unaccounted heat losses are 4% and station service allowance is 6%. (Heat rate = 11,395 kJ/kWh).	[5]	3	3
Q.3(b)	Calculate the heal available in the exhaust gases from the combustion of 100 TPD of MSW with HHV = 14000 kJ/kg. Assume that incinerator residue contains 5% C and temperatures of the entering air and grate residue are 30 and 450°C, respectively.	[5]	3	4

Element	% by Mass
C	25
H	5
O	20
N	5
S	2
Moisture	20
Inert Materials	15

Given data: heating value of C 32789 kJ/kg, heat of vaporization of water 2420 kJ/kg, radiation loss 0.005 kJ/kg, sensible heat of residue 1047 kJ/kg.

Q.4(a)	Illustrate the components of a sanitary landfill with the help of a neat sketch.	[5]	4	4

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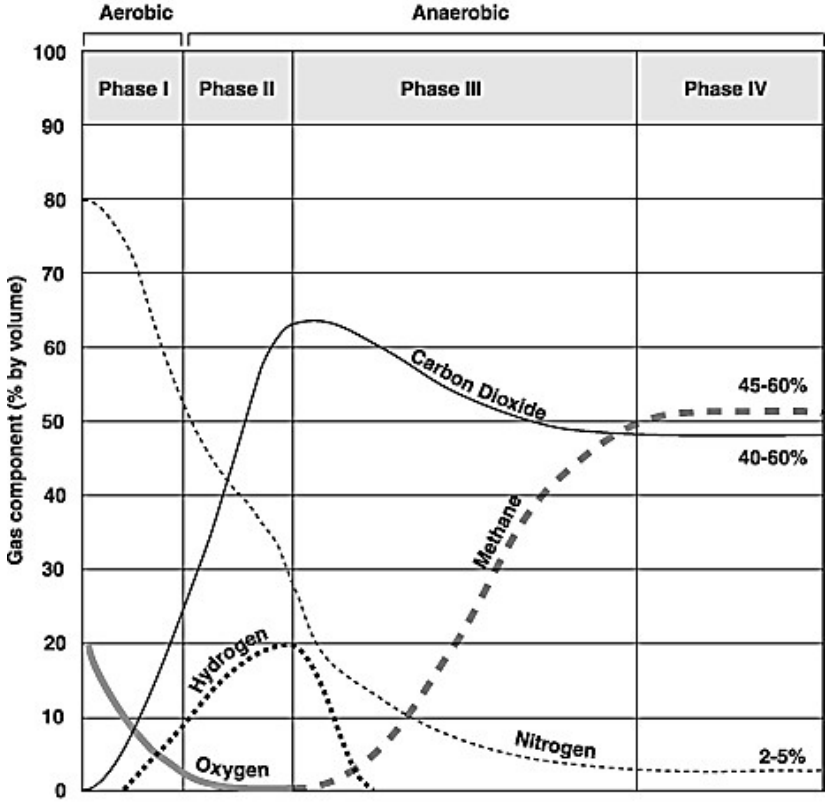
Q.4(b) Using the diagram below, explain the different phases of gas production in a sanitary landfill. [5] 4 4



Q.5(a) Discuss the environmental monitoring systems needed for landfill sites. [5] 5 2

Q.5(b) Examine the processes that can be applied to remediate sanitary landfill sites. [5] 5 4

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