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**National Institute of Technology, Hamirpur**  
B. Tech. (Chemical Engineering) - 7<sup>th</sup> Semester  
End Term Exam (November, 2022)  
**CH-452 Solid Waste Management**

**Duration: 3 hrs**

**Max. Marks: 50**

Note: This question paper consists of four questions and one page.

• Attempt all questions, and Assume appropriate data wherever necessary

**Q1. Attempt the following;**

**[2×5 = 10]**

- (1a) List the factors which affect production of leachate and landfill gas in the landfill?
- (1b) Draw neat sketch of plasma processes used in hazardous solid waste treatment.
- (1c) Draw the neat sketch of conventional type and zig-zag classifier used for air separation in SWM system.
- (1d) Write short notes on estimation of future per capita waste quantity along with approximate numerical data, (1e) Draw Hierarchy of municipal solid waste management.

**Q2. Attempt the following;**

**[5+3+7 = 15]**

- (2a) On-Site Handling, Storage and Processing of Solid Waste generated from different sources in details. [5]
- (2b) List out the factors to be considered while deciding collection efficiency in a SWM system. Also write down the mathematical expression of collection efficiency along with notations. [3]
- (2c) With the aid of a neat sketch explain the process of incineration. Also, explain the 3Ts of incineration process along with their importance. [7]

**Q3. Attempt the following;**

**[6+4 = 10]**

- (3a) What is leachate? With neat sketch, discuss the control of leachate and gas movement with vents and barriers in sanitary landfill sites. Also, write down the complete set of mathematical expressions required to design sanitary landfills. [6]
- (3b) Determine the area and size of landfill required for a municipality with a population of 50000, given the following data, (i) Solid waste generation = 1500g/p/d, Compacted density of landfill = 500 kg/m<sup>3</sup>, (iii) Average depth of compacted solid waste = 3m [4]

**Q4. Attempt the following;**

**[7+8 =15]**

- (4a) Explain EPA - identification of hazardous and toxic waste. Write down the characteristics of hazardous waste and explain any one. [7]
- (4b) An area consisting of 400 houses contributes solid waste. Estimate the solid waste generation rate, if the observation is a local transfer station and period of generation is one week. The waste is carried out in two types of vehicles Viz, compactor trucks and flatbed trucks. Additional Data is as follows; [8]  
No. of compactor truck load = 10, No. of flatbed truck load = 20, Vol of each compactor truck = 15m<sup>3</sup>, Vol of each flatbed truck = 1.25m<sup>3</sup>, Density of waste of compactor truck = 295 kg/m<sup>3</sup>, Density of waste of flat bed truck = 110 kg/m<sup>3</sup>, No. of persons in each house = 6

Also, find out (i) Total quantity of waste generated, (ii) No. of people, (iii) Per capita SW generated

----- All the best -----