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10CV757

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

**Solid Waste Management**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting at least TWO questions from each part.

**PART - A**

- a. Explain the classification of functional elements of a solid waste management system with the help of flow diagram. (07 Marks)
- b. Estimate the energy content of a solid waste sample in unit energy content on dry basis and Ash free dry basis. Assume Ash 5%. (07 Marks)

Component	% by mass	% moisture content	Energy [kJ/kg]
Food waste	15	70	4650
Paper	45	06	16750
Cardboard	10	05	16300
Plastic	10	02	32600
Garden trimmings	10	60	6500
Wood	05	20	18600
Tin cans	05	03	700

- c. Briefly discuss on the various methods used to estimate waste quantities. (06 Marks)
- a. With a neat sketch, explain hauled container system. (06 Marks)
- b. Discuss the factors influencing the solid waste generation rates. (06 Marks)
- c. The student population of a school is 881. The school has 30 standard classrooms, assuming five day school work with solid waste pick-ups on Wednesday and Friday before school starts in the morning, determine the size of the storage container required. Assume the rate of waste generated is equal to 0.11kg/cap.d plus 3.6kg per room and that the density of uncompacted municipal solid waste are 120.0kg/m<sup>3</sup>, standard container sizes are 1.5m<sup>3</sup>, 2.5m<sup>3</sup>, 3.0m<sup>3</sup> and 4.6m<sup>3</sup>. (08 Marks)

Discuss on the factors that must be considered in the design of transfer station. (08 Marks)

Explain the mechanical volume reduction and chemical volume reduction. (08 Marks)

List the principal components in the design of large municipal incinerators. (04 Marks)

Enumerate on various techniques of component separation. (07 Marks)

With a neat sketch, explain municipal incinerators. (07 Marks)

Explain the effect of 3T's in incineration process of solid waste. (06 Marks)

## PART - B

- 5 a. What are the important factors for the design considerations in anaerobic composting? (08 Marks)
- b. Briefly discuss on the difference between Indore and Bangalore process of composting of municipal solid waste. (04 Marks)
- c. Determine the amounts of oxygen required to oxidize 1 tonne of waste and also to stabilize Ammonia in having the chemical equation :  $C_{50}H_{100}O_{40}N$ , use equation :
- $$C_aH_bO_cN_d + \frac{4a - b - 2c + 3d}{4} H_2O \rightarrow \frac{4a + b - 2c - 3d}{B} CH_4 + \frac{4a - b + 2c + 3d}{B} CO_2 + dNH_3$$
- (08 Marks)
- 6 a. Explain the various factors to be considered in selection of a site for sanitary land fill. (08 Marks)
- b. Explain the area method and trench method of landfilling techniques stating merits and demerits. (08 Marks)
- c. Determine the landfill area required for municipality with a population of 50,000 given that :  
 Solid waste generation = 360 gm/person/day  
 Compacted density of land fill = 504 kg/m<sup>3</sup>  
 Average depth of compacted solid waste = 3m. (04 Marks)
- 7 a. Explain the various ways of control of gas movement in landfills. (08 Marks)
- b. Define liachate and list out the factors that affect the composition of liachate. (04 Marks)
- c. List the advantages and disadvantages of open dumping and ocean disposal of solid waste. (08 Marks)
- 8 a. Outline the importance of recycle and reuse of plastic materials with examples. (06 Marks)
- b. Explain the categories of biomedical waste and method of disposal. (07 Marks)
- c. Explain the environmental significance of reuse and recycle solid waste. (07 Marks)

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