

# CBCS SCHEME

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18CV642

## Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Solid Waste Management

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. With a neat schematic diagram, explain the functional elements of SWM and discuss about salient feature of SWM rules 2000 with 2016. (12 Marks)
- b. Estimate the energy content of a Solid Waste sample with a composition :

| Component      | Food waste | Paper | Cardboard | Plastic | Garden Trimming | Wood  | Can |
|----------------|------------|-------|-----------|---------|-----------------|-------|-----|
| % by mass      | 15         | 45    | 10        | 10      | 10              | 5     | 5   |
| Energy (kJ/kg) | 4650       | 16750 | 16300     | 32600   | 6500            | 18600 | 700 |

(08 Marks)

**OR**

- 2 a. Explain the personal responsible and auxiliary equipment used in the handling and separation of solid waste at the source. Discuss about transfer station importance in MSW management. (12 Marks)
- b. Solid waste from a new industrial parts is to be collected in large containers, 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 in 6 min and the one way distance to the disposal site is 24.8 km (speed limit 88km/hr). Determine the numbers of containers that can be emptied per day, based on an 8 hr work day. Assume off route factor,  $w$  is 0.15. (08 Marks)

### Module-2

- 3 a. Explain the Density separator, Hand sorting and Magnetic separation. (12 Marks)
- b. Define the term "Size reduction". List the common types of device used to reduce the size of MSW. With a neat sketch, give the salient features of any one. (08 Marks)

**OR**

- 4 a. Enumerate the objectives of components separation of MSW. List the types of devices commonly used for the separation of solid waste material. Give the schematic diagram of any one with salient feature. (10 Marks)
- b. Write a short note on Chemical volume reduction. (10 Marks)

### Module-3

- 5 a. Write a short note on Control of gas movement in sanitary landfill and Leachate movement along with control measures, with a neat sketch. (12 Marks)
- b. Estimate the required landfill area for a community with a population of 31000. Assume that the following condition apply : \* Solid waste generation = 2.90kg/capita. d ;  
\* Compacted specific weight of SW in landfill = 475 kg/m<sup>3</sup> ;  
\* Average depth of compacted solid waste = 20 ft ;  
\* Terrain type is hilly region.

Comparing the result which type of land fill method you suggest and justify it. (08 Marks)

**OR**

- 6 a. Define Composting. Enumerate the objectives of composting and list the types in Aerobic composting , Anaerobic composting. Explain any one from each type. (12 Marks)  
b. Estimate the theoretical volume of methane gas that would be expected from the anaerobic digestion of a tonne of a waste having the composition  $C_{50} H_{100} O_{40} N$ . (08 Marks)

**Module-4**

- 7 a. Explain about recycle / reuse / recovery of construction waste in SWM. (10 Marks)  
b. Discuss the Source , Collection and Conveyance of Bio medical waste. (10 Marks)

**OR**

- 8 a. List and explain method used for Biomedical waste disposal and Demolish waste disposal. (10 Marks)  
b. Discuss about collection , treatment and disposal of E - Waste. (10 Marks)

**Module-5**

- 9 a. Discuss the classification of Hazardous waste, Hazardous waste treatment and disposal. (12 Marks)  
b. What are 3T's of incineration process? Explain about the design criteria for incineration. (08 Marks)

**OR**

- 10 a. Explain with a flow diagram, energy recovery system from solid waste. (10 Marks)  
b. Define Pyrolysis. With a neat flow diagram, explain about process of pyrolysis. (10 Marks)

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