

B.E / B.Tech (FULL TIME) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011

CIVIL ENGINEERING BRANCH

FIFTH SEMESTER

CE 9048 MUNICIPAL SOLID WASTE MANAGEMENT

(REGULATION 2008)

Time: 3 Hr

Max.Marks: 100

Answer All Questions

Part – A (10 X 2 = 20 Marks)

1. What are the public health and environmental significance of municipal solid wastes?
2. Determine the moisture content of 300 kg sample of waste if its dry mass is 180 kg.
3. What is the purpose of waste segregation?
4. What are the effects of storage of waste in containers?
5. What are the heuristic rules for routing of waste collection?
6. What is the purpose of Transfer Station?
7. List out and explain the waste to Energy Technologies.
8. Draw a neat sketch on Conventional standard rate Anaerobic Digester.
9. How to minimize the generation of leachates from landfills?
10. What steps are required to convert an open dumping practice to controlled dumping?

Part B (5 X 16 = 80 Marks)

11. (a) (i) Explain the onsite storage methods for municipal solid wastes. (16)

12.(a) (i) Explain the mandatory requirements regarding waste management as envisaged in the Municipal Solid Waste (M&H) Rules, 2000. (16)

(OR)

(b) (i) Explain the physical, Chemical and biological transformations of MSW. (16)

13. (a) (i) Explain with a neat sketch the different types of transfer station. (8)
- (ii) Explain the difference between Stationery Container System and Hauled Container system using a neat sketch. (8)

(OR)

(b) (i) You have bagged the contract to haul the solid wastes from an industrial city where the wastes are stored in large containers located at strategic points. Based on a traffic study, " t_1 ", " t_2 " and " t_{bc} " were found to be 20, 25 and 8 minutes respectively. If the round trip haul distance averaged 60 km, how much wastes can be collected on a collection day of 8h. Assume that Off Route-Factor = 0.15

- Truck unloading time at disposal site = 7.50 min.
- Delay time at disposal site = 20 min.
- Haul time constants $a = 0.016$ h/trip
 $b = 0.018$ h/km.
- Container Loading time = 15 min
- Container unloading time = 10 min
- Container Capacity = 15 m^3

Average Container Utilisation Factor = 80% (16)

14. (a) (i) How many kg of air is required to compost one kg of solid wastes, if 40% of the waste remains after the composting process. Assume that the composition of the waste material is

$[\text{C}_6\text{H}_7\text{O}_2(\text{OH})_3]_5$ and that of the compost is $[\text{C}_6\text{H}_7\text{O}_2(\text{OH})_3]_2$ (8)

(ii) Draw and explain the Process Flow Diagram of a Biomethanation Plant? (8)

(OR)

(b) (i) What are the different components of a Waste Incineration facility and the emission controls to be provided for incineration? Also Explain the measures to express the performance of incineration (16)

15. (a) (i) With the help of a neat sketch explain the essential components of a landfill and their Functions. (8)

(ii) Explain the Land filling methods with neat sketches. (8)

(OR)

(b) (i) Describe the 5 phases a landfill undergoes during its lifetime. Discuss the characteristics of leachate and landfill from each phase? (8)

(ii) The foot print area of a landfill is 1000 ft by 750 ft. The anticipated depth is 30 ft. The Side Slope, $S=3$. What is the volume in yd^3 ? What would be the capacity (years) of the landfill if C&D debris waste accepted at 500 tons per day and the landfill debris density was 1500 pcy ? (8)