

B.E/B.TECH (FULL TIME) DEGREE END SEMESTER END EXAMINATIONS

NOVEMBER / DECEMBER 2012

CIVIL ENGINEERING BRANCH (SEMESTER VI)

CE 9048 – MUNICIPAL SOLID WASTE MANAGEMENT

(REGULATIONS 2008)

23

Max.Time – 3 hours

Max. Marks – 100

Instructions

- Answer all Questions in Part A
- Answer Question 11 and (a) OR (b) of Questions 12 to 15 in Part B
- Assume suitable data wherever necessary.
- Each Question in Part A carry 2 marks and that in Part B carry 16 marks.

Part A (10 x 2 = 20 marks)

- 1 List the elements of integrated waste management?
- 2 What are the public health and environmental impacts of municipal solid wastes?
- 3 What is the significance of public participation in waste management?
- 4 Suggest four measures for source reduction of municipal solid wastes.
- 5 Describe the Hauled Container type of waste collection system?
- 6 List the factors to be considered while finalizing the waste collection routes?
- 7 What are the objectives of air classification and shredding operation?
- 8 Compute the percentage volume reduction and compaction ratio achieved if the waste volume of 25 m^3 is reduced to 10 m^3 ?
- 9 Draw the cross section of the liner system recommended for sanitary landfill.
- 10 How to extend the life of a sanitary landfill?

Part B (5 x 16 = 80 marks)

- 11 (i) A residential complex with 180 apartments is having a population of 960 .The average waste generation rate is 500 g/capita/day . The solid waste from the complex is stored in a central place and picked up by the Municipality on every Wednesday and Saturday morning. If the average density of solid waste in the storage container is 150 kg/m^3 , what will be ideal size of storage container(s) required? The standard sizes of available containers 3.0, 4.5 and 6 m^3 in volume. (8)
- (ii) Discuss the role of different stakeholders to enhance waste reduction and recycling. (8)
- 12a) i) Describe the steps involved in characterization of solid wastes and present typical composition of Solid Wastes from Indian Cities? (8)
- ii) Briefly explain the factors affecting the per capita waste generation rate and waste composition. (8)

(OR)

12 b)(i) List the mandatory requirements of the Municipal Solid Waste (Management and Handling) Rules. (16)

13 a) (i) Determine the break even time for a Stationery container system of 4 t capacity with an operating cost of Rs.25/h and a Truck semitrailer combination of 25 t capacity with an operational cost of Rs.55/h, if the transfer station cost is Rs 3/t. (6)

(ii) Compare the advantages and limitations of different options for residential and commercial waste collection (10)

(OR)

13 b) i) It takes 30 minutes to drive a collection vehicle from the city garage to the beginning of the route, 40 minutes to drive between the route and the disposal site, and 20 minutes to return the empty vehicle from the disposal site to the garage. It takes 15 minutes to off-load the vehicle at the disposal site. The crew takes two 15-minute breaks per day and allows 30 minutes for unexpected delays. If two trips are made to the disposal site per day, calculate the time left in an 8-hour workday for the solid waste pickup. (8)

ii) Explain the purpose, components and operation of Transfer Stations? (8)

14 a)i) With the help of Process Flow Diagram, discuss the process steps and applicability of biomethanation and incineration for the recovery of energy from municipal solid wastes in Indian Context. (16)

(OR)

14 b)(i) Describe the Windrow Composting Process clearly explaining the factors affecting the performance and the control methods. (16)

15 a) i) List the essential components of a Sanitary Landfill (8)

(ii) Estimate the landfill area required for disposing the solid wastes from a city of 1,00,000 people if

- average solid waste generation rate = 600 g/capita/day
- the annual increase in population is 1%
- landfill design life = 20 years
- density of solid wastes = 400 kg/m³
- compaction ratio at landfill = 2
- average depth of the fill = 6 m
- landfill space required for intermediate and final cover = 5%
- additional land requirements for buffer zone and utilities = 25%

(8)

(OR)

15b) (i) List the important measures required to convert an open dump to a sanitary landfill. (8)

(ii) List the steps involved in identification of land for disposal of wastes (8)