



M.E DEGREE EXAMINATIONS: NOV/ DEC 2024

(Regulation 2024)

First Semester

ENVIRONMENTAL ENGINEERING

24ENT504: Solid And Hazardous Waste Management

COURSE OUTCOMES

- CO1:** Analyze the types of wastes and quantify the impacts of disposing wastes to human health and ecosystem.
- CO2:** Develop a waste characterization plan and implement waste reduction and recycling strategies, including Extended Producer Responsibility (EPR) and circular economy practices
- CO3:** Design systems and processes to effectively minimize, store, collect, transport, and recycle waste to meet specific requirements under given conditions
- CO4:** Understand the principles of waste processing technologies to select appropriate methods for processing solid and hazardous wastes, focusing on environmental control.
- CO5:** Design an ultimate waste disposal system and apply integrated waste management concepts to real-world scenarios, supported by case studies

Time: Three Hours

Maximum Marks: 100

PART A (4*20 = 80 Marks)

1. a) With a neat schematic diagram, Explain the functional elements of the solid waste management 8 CO1 [K₁]
- b) Estimate the unit solid waste generation rate for a residential area having 800 dwellings. The observations made at a local transfer station for a week time revealed that the waste was carried in self-compacting trucks and flatbed trucks. 8 CO1 [K₃]
- Volume of self-compacting trucks = 1.5m³
 Volume of flatbed trucks = 1.25m³
 Density of waste in self compacting trucks= 295kg/m³
 Density of waste in flatbed trucks = 110kg/m³
 Assume 10 self-compacting truck loads /week and 20 flatbed truck loads / week.

- c) Differentiate between Non Hazardous waste and Hazardous waste. Give 4 CO1 [K₂]
example.
2. a) Discuss physical, chemical and biological properties of MSW 8 CO2 [K₁]
b) How companies can taking back their old products (recycling) and how can 8 CO2 [K₃]
reuse things to make new ones instead of throwing them away. What ideas
do you have? Discuss
c) Give your suggestion to “Change of technology” in cement industry 4 CO2 [K₄]
3. a) A residential complex with 200 apartment is having a population of 2000 8 CO3 [K₃]
nos..The average waste generation rate is 500 g/capita/day. If the average
density of solid waste in the storage container is 15 kg/m³.What will be the
size of storage container required. The standard size of available container 3,
4, 5 and 6 m³.in volume.
b) A stationary container system (mechanically loaded), 4 collection trips/wk. 8 CO3 [K₃]
8hrs/day, 3.22 h/trip (pick up time), at site time 1h/trip, round trip =
10miles, a=0.018 h/trip. b= 0.020h/trip, productive time = 85% . Find the
time required per week Discuss the importance of public involvement and
participation in SWM
c) Enlist any four transport vehicle with their capacities for transporting 4 CO3 [K₂]
municipal waste
4. a) Estimate the energy content of solid waste (on dry basis and ash free basis) 8 CO4 [K₃]
with the following composition given in the table below. The determined
moisture content and ash content for the solid waste were 25% and 5%
respectively.

Components	% by mass	Energy KJ/kg
Food waste	35	4650
Paper	25	16750
Cardboard	5	16300
Plastics	15	32600
Garden Trimmings	5	6500

Wood	10	18600
Tin cans	5	700

- b) Describe the techniques of energy recovery from municipal solid waste by using AI in Biochemical process. 8 CO4 [K₄]
- c) Describe the TCLP test procedure and its significance? 4 CO4 [K₂]

Answer any ONE Question
PART B (1*20 = 20 Marks)

5. a) With a neat sketch, explain the working of conventional municipal solid waste management incinerator 8 CO5 [K₂]
- b) A colony having a population of 1 lakh generates solid waste at the rate of 1.5kg/capita/day. The specific weight of solid waste in landfills is 750kg/m³ and average depth of solid waste in land fill is 5m. Design the landfill 8 CO5 [K₃]
- c) Explain the adverse health and environmental impacts due to improper handling of solid waste. 4 CO5 [K₂]

OR

6. a) How can the Vellore dumping yard implement effective recycling and reuse practices to reduce waste and promote sustainability? Discuss 8 CO5 [K₄]
- b) A community generates solid wastes at a rate of 100 tons/day. The solid waste has to be disposed off in landfill cell of 5m width and 3m lift. Determine the length of the landfill if the specific weight of waste as 600kg/m³. Draw neat sketch of the Landfill 8 CO5 [K₃]
- c) Differentiate stabilization process from solidification in contaminated soil. 4 CO5 [K₂]
