

Time: 1 hour

Max Marks: 25

1. Indicate all the steps which are taken for compacting a clay liner on top of subgrade soil at base of a landfill until the geomembrane is laid over it. (2)
2. By means of a diagram show, in section, the minimum prescribed components of a cover system for hazardous waste landfill as per CPCB norms. (2)
3. Diagrammatically depict the details of the junction of cover, of an above-ground landfill, at ground level with leachate collection header pipe, surface water drain and liner system. (2)
4. In Q2, which components are replaced by geosynthetics when the cover is placed on steep slopes and what additional components may be added? (2) ✓
5. List the advantage and disadvantages of horizontal gas collection systems versus vertical gas wells in MSW landfills. (2)
6. Compute the total expenditure on leachate treatment from beginning of the landfill till the end of 3rd phase for the case shown in Fig 1, given that the rate of treatment is Rs 4 per kilolitre of leachate. (3)
7. Compute the total mass of chlorides which will leak out, per sq. m., by steady state advection in 5 years and 25 years through GCL and CCL shown in Fig2. Consider that both are hydrated with fresh water in the beginning. Chloride concentration in leachate: 400mg/l. (3)
8. Derive the expression for Factor of Safety against sliding of a leachate collection layer over the top of the geomembrane layer of a liner system under horizontal force of an earthquake. Assume infinite slope. (2)
9. How will you monitor the leachate head within a landfill? (2)
10. A factor of safety of 1.5 is required against sliding between geomembrane and geotextile shown in Fig.3 under the static case for dry soil. What should be the allowable tensile strength of a geogrid reinforcement placed above the geotextile? (Use enhanced resisting force approach) (3)
11. For site selection of landfills as per CPCB (2003), name any two attributes which lie amongst the top four in terms of weightage. (1)
→ POP, etc
12. Under what conditions will the cost of a geomembrane be more than that of compacted clay in a single composite liner system of an MSW landfill? (1)