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CVL 721 Solid Waste Engineering

Minor 2 Examination Total Marks: 60 Time 1 Hour

48½/60

Do not ask any doubt. Fill up the blanks with the most suitable/appropriate correct answer. Answer could be more than a word; even sentences. Do not exchange any material during the exam. No mobile / cell phones with you during the exam. No any kind of communication allowed during the exam.

Marks: +2 for correct answers. All question carries equal mark.

1. Anaerobic composting methods take about ---4-6 months--- ------ to make ripe compost; whereas, rotary drum composting techniques takes only about ---2-4 weeks---

2. The three furnaces that can be used for incinerating MSW are:---grates/stoker---, ---Rotary kiln--- and ---Fluidized bed---.

3. The main acidic gases that may be produced during incineration are:---HCl--, ---HF---, ---SO_2---, ---NO_x--- and ---CO_2---

4. ---Venturi metre scrubber--- is perhaps the most popular air pollution control equipment in India as it can remove (to some extent) both ---particles--- ---and acidic gases---

5. Fluidized Bed Furnace, offers high ---thermal efficiency--- and high ---combustion--- due to the high turbulence.

6. As per the Municipal Solid Wastes (Management and Handling) Rules, 2000, waste must be ---segregated--- before finally disposing into a ---MSW bin---

7. As per the Municipal Solid Wastes (Management and Handling) Rules, 2000, minimum bottom liner specifications shall be a composite barrier: ---1.5 mm--- ---HDPE geomembrane---, overlying ---compacted clay layer--- having permeability coefficient less than ---10^{-7} cm/s---.

8. Some of the plastics should not be burnt; for eg. burning of ---Polythene--- ------- may produce toxic gases like phosgene and burning of ---PVC--- ---------- may produce dioxins and furans.

9. The six Environmental parameters considered for the calculation of LPPI are:- subsurface water (LPI), surface water (SWQI), Air quality (LAI) Noise (LNI) Flora and fauna, Aesthetics (LAI) 2

10. In the LPPI matrix, for a Water Quality Index of 60 (out on 100), the severity estimated is $\frac{100-60}{100} \times 5 = 2$ 2

11. Landfill Aesthetic Index, LAI $= \Sigma S_i W_i$ where S_i is the sub index values decided by experts and W_i is the weightage of the paramters 1½

12. In vermi-composting, earthworms do mot degrade the organics directly but break down the complex organics into simple one and provide environment for multiplication of aerobic bacteria 2

13. The Timarpur MSW incineration plant failed to work properly because: the plant was designed for about 2000 kcal/kg of waste and actually the waste had CV of (800-1200) kcal/kg (1)

14. In a bioreactor landfill, the possibility of slope failure is very high due to the pore water pressure. Also, the possibility of a fire is also high as CH4 is getting produced and rag pickers throws matchstick / cigaretto her by here, stone rubbing, air pockets. (1½)

15. In the case of a dry tomb landfill, the land may be blocked for a century from construction activities as there can be huge differential settlement of building constructed due to variation in waste 2

16. In a Rotary Kiln type Incineration Furnace, turbulence is achieved by the tumbling of waste in the kiln and the turbulence depends on angle of repose and relative smoothness of surface of kiln (1)

17. Although vermi-composting is faster than ordinary composting, it is not usually recommended for large communities / cities as : care should be taken of earthworms citrus, salt, hazardous waste so large segregation is not possible and as height can't be increased than 50 cm as they are surface dwellers and don't want to go down so a large area is required (2)

18. In the production of RDF (refuse Derived Fuel) from MSW: raw MSW is dried first and then ~~shredded~~ ball mill, air separation and then again shredding of lighter part (fluff formed) before it is pressed to get the RDF pellets.

19. Incineration facilities with Fluidized Bed Furnaces usually give out minimum NO_x as the temperature of bed is 800-900°C and the Nitrogen present in air start combushing only after 1200°C otherwise only waste is Nitrogen is burnt

20. Coarse particulates are usually removed from the flue gas before it is treated for fine particles in an ESP as particles are charged by electrodes & then grounded for large particle very large amount of energy will be required, also, when flue gas treated for acidic gases in a packed scrubber as the particles can block the pores in the packing and can increase pressure drop

21. Heat content of MSW can be improved by drying it, removing inert materials and increasing high calorific substance like plastic, paper etc

22. Earthworms can eat food upto about 30% of their body mass and live for about 1-2 years

23. When the N,P,K contents of vermi- compost is about 1-2:1, the same for mechanical-compost is about greater than 2

24. When the vermi-compost is ready, the earthworms are removed by simply ~~supply food~~ another place or expose to sunlight as are highly sensitive to UV rays

25. Between bottom ash and fly ash, fly ash is more dangerous as bottom ash only contain inert particles and fly ash contains carcinogenic dioxins, furans, Heavy metals attached to particle.

26. The heat content of dense RDF pellets is approximately 4000 kCal/kg. Usage of binders (during the manufacture of RDF) was discontinued

as the calorific value of binder was low & it was decreasing the overall Heat content of pellets

27. 'separation of the unwanted materials' is usually done after composting as---- the wright of total waste decreases and ---microorganism dies so less danger of contamination

28. The components of MSW that are likely to increase / improve over the next 10 years are ---Plastic---, ---C & D waste---, ---Paper---

29. Nitrogen content of the waste is assumed to be getting oxidized to NOx because---the Nitrogen of the air only get oxidized when temp is above 1200°C so Nitrogen content of waste is removed only getting oxidized in incinerator

30. During the incineration, heavy inorganic matter like metals, glass, C & D Waste end up in the ---bottom ash--- where as ash from the burning of leaves, papers, hardboard etc becomes the ---flyash---.