



Name: Roll No.:

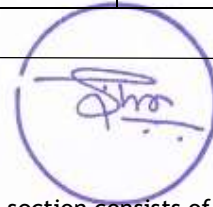
Branch: Signature of Invigilator:

Semester: VIth Date: 27/04/2022 (MORNING)

Subject with Code: CE421 SOILD WASTE MANAGEMENT

| Marks Obtained | Section A (30) | Section B (20) | Total Marks (50) |
|----------------|-------------------|-------------------|---------------------|
| | | | |

INSTRUCTION TO CANDIDATE



1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. Candidates should write their roll no. in each page of the booklet.
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to submit the question paper cum answer sheets before leaving the examination hall.

10. Under which rule of Government, guidelines for solid waste management are followed today?
- a) Municipal Solid Waste Rules, 2000
 b) Municipal Solid Waste Rules, 2016
 c) Solid Waste Rules, 2000
 d) Solid Waste Rules, 2016
11. Which of the following material is used as land fill sealants for the control of gas and leachate movement?
- a) Lime
 b) Sand
 c) Fly ash
 d) Bentonite
12. The major constituent gases produced from a landfill are -
- a) CO₂ and CH₄
 b) NH₃ and H₂
 c) CO and N₂
 d) H₂S and O₂
13. The maximum C/N ratio in a MSW compost is -
- a) 10:1
 b) 20:1
 c) 30:1
 d) 40:1
14. Choose the appropriate Landfilling method
- a) Area Method
 b) Trench Method
 c) Slope Method
 d) All of the above
15. Which of the following is a biological method of disposal of municipal solid waste?
- a) Landfills
 b) Shredding
 c) Pulverization
 d) Composting
16. _____ is a liquid that passes through solid waste and extracts suspended impurities from it.
- a) Leachate
 b) Sludge
 c) Distilled water
 d) Municipal waste
17. Full form of EMS –
- a) Environmental Monitoring System
 b) Environmental Management Services
 c) Environmental Monitoring Services
 d) None of these
18. Which of the following should not be a criterion for choosing the site of landfill –
- a) Low Population Density
 b) High Alternate Land use value
 c) High clay content in sub-soil
 d) Low ground water level contamination potential
19. Most Common Problems with Landfills are –
- a) Landfill Gases
 b) Leachate
 c) Either A or B
 d) Neither A nor B
20. An Engineered facility for the disposal of municipal solid waste is –
- a) Tandom Fills
 b) Sanitary Fills
 c) Secured Fills
 d) None of these
21. Which of the following statements is correct regarding leachate?
- a) It can be discharged in water bodies without any treatment.
 b) It can be used for the irrigation in parks
 c) It is used for the treatment of wastewater
 d) It is generated in a landfill

22. Which one of the following statements is correct?
- | | |
|---|---|
| a) Pyrolysis is an exothermic process, which takes place in the absence of oxygen. | c) Pyrolysis is an endothermic process, which takes place in the abundance of oxygen. |
| b) Pyrolysis is an endothermic process, which takes place in the absence of oxygen. | d) Pyrolysis is an endothermic process, which takes place in the abundance of oxygen. |
23. Landfill design life will comprise of an 'active' period and an 'closure and post-closure' period. The 'Active' period of a landfill may range from
- | | |
|--|---|
| a) 0 to 5 years depending on the availability of land area. | c) 10 to 25 years depending on the availability of land area. |
| b) 5 to 10 years depending on the availability of land area. | d) None of these |
24. Which of the following methods is better for the solid waste problem?
- | | |
|----------------|----------------------|
| a) Recycling | c) Both a and b |
| b) Landfilling | d) None of the above |
25. A landfill should not be constructed in areas where water table is less than
- | | |
|----------------------------|-----------------------------|
| a) 2m below ground surface | c) 5m below ground surface |
| b) 4m below ground surface | d) 10m below ground surface |
26. Landfill design life will comprise of an 'active' period and an 'closure and post-closure' period. The 'closure and post-closure' period for which a landfill will be monitored and maintained
- | | |
|---|--|
| a) will be 25 years after the 'active period' is completed. | c) will be 100 years after the 'active period' is completed. |
| b) will be 50 years after the 'active period' is completed. | d) None of these |
27. A landfill after post closure plan can be used as golf-course or park.
- | | |
|---------|----------|
| a) True | b) False |
|---------|----------|
28. Which of the following is done on an individual level?
- | | |
|-------------|---------------------|
| a) Burning | c) Recycling |
| b) Disposal | d) Source reduction |
29. The WHO has classified the bio-medical waste into _____ categories.
- | |
|------|
| a) 5 |
| b) 4 |
| c) 3 |
| d) 2 |
30. Which of the following is not the municipal solid waste?
- | | |
|--------------------------|----------------|
| a) Radioactive substance | c) Food wastes |
| b) Ashes | d) Rubbish |

SECTION B

- All the questions are compulsory.
- The missing data, if any, may be assumed suitably.

1.(a) What do you mean by 'Integrated Solid Waste Management (ISWM)? [2]

1.(b) Estimate the as-discarded energy content for as waste with the following compositions: [2]

| Component | Percent by mass | *Energy, KJ/kg |
|------------------|-----------------|----------------|
| Food wastes | 20 | 4650 |
| Paper | 50 | 16750 |
| Cardboard | 8 | 16300 |
| Plastics | 6 | 32600 |
| Garden trimmings | 6 | 6500 |
| Wood | 5 | 18600 |
| Inerts | 5 | 7000 |

*as-discarded basis

2. Solid waste from a new industrial park is to be collected in a large container (drop boxes), some of which will be used in conjunction with stationary compactors. Based on traffic studies at similar parks, it is estimated that the average time to drive from garage to the first container (t_1) and from the last container (t_2) to the garage each day will be 15 and 20 mins, respectively. If the average time required to drive between containers is 6 min and the one-way distance to the disposal site is 25 km (speed limit: 88 kmph), determine the number of containers that can be emptied per day, based on an 8-h workday. Take $pc + uc = 0.4$ h/trip; $S = 0.133$ h/trip; $a = 0.016$; $b = 0.011$; $W = 0.15$ symbols having usual meaning. [4]

3.(a) Determine the amount of air required to oxidize completely 1 tonne of waste having the chemical formula as $C_{50}H_{100}O_{40}N$. [2]

3.(b) Name any three equipment for each case which are used to accomplish following processing techniques: [2]

- i. Mechanical size and shape alteration
- ii. Mechanical component separation

4.(a) Give a neat sketch of a typical layout of a landfill. Show various facilities provided at a landfill site. [2]

4.(b) Estimate the landfill area required for a city of one million people. Use typical data for a large city. Assume compacted density of waste within the site as 0.6 tons/ m^3 . The average depth of waste is 10 m. The landfill should be designed for 20 years. [2]

5. Discuss the salient features of Municipal Solid waste Management rules, 2016. [4]



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