THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

SECOND SEMESTER EXAMINATION – 2022

CEME514 – SOLID WASTE AND RESOURCE MANAGEMENT

MASTER OF SCIENCE IN SOLID WASTE & RESOURCES MANAGEMENT

Thursday 27th OCTOBER 2022 – 10:00 am to 12 Noon

VENUE: PG CLASS ROOM

TIME ALLOWED: 2 HOURS

INSTRUCTIONS FOR STUDENTS:

1. **WRITE YOUR NAME AND ID NUMBER CLEARLY ON THE FRONT PAGE OF THE ANSWER SHEET.**

2. All answers must be written on the answer booklet provided. No other written material will be accepted.

3. Notes and handouts are not allowed. MOBILE PHONE is not allowed.

4. Maximum Marks: 100.

5. Answer any **FOUR** questions. All questions carry equal marks i.e. 25 marks.

6. Number of pages is **3** including Cover page.

Answer any Four questions. All questions carry equal marks (M) i.e., 25 marks

1. a) List the sources of domestic solid waste.   **[5M]**
    b) List out various gases emitted from incineration process.   **[5M]**
    c) What is meant by pyrolysis?   **[5M]**
    d) Explain waste landfill remediation.   **[5M]**
    e) What is the role of transfer station in solid waste management?   **[5M]**

2. a) Explain about the factors influencing the generation of solid waste.   **[12.5M]**

    b) What are the various wastes processing systems? Give their suitability for processing of different types of wastes components.   **[12.5M]**

3. a) Explain what happens to garbage after it is put to a landfill.   **[5M]**
    b) What are the physical and chemical changes that take place in a landfill during its life ? **[5M]**
    c) Classify the constituents of municipal solid waste.   **[5M]**
    d) What are the methods of collection system adopted in solid waste?   **[5M]**
    e) Mention the various parameters to be taken in a disposal yard.   **[5M]**

4. Solve the following Numerical Problems
    a) A residential waste has the components presented in the table. **Estimate its moisture concentration** using the typical values.   **[12.5M]**

Component	Percentage (%)	Typical Moisture Content
Tin cans	10	3
Paper	40	6
Rubber	20	2
Food waste	20	10

   b) A certain community produces the following quantities of solid waste on an annual basis:

Fraction	Tons per year
Mixed house waste	250
Recyclables	30
Commercial waste	50
Construction and demolition debris	135
Leaves and miscellaneous	40

Generated recyclables are collected separately and processed at a materials recovery plant. Both mixed household and commercial wastes are taken to the municipality landfill, as do the leaves and miscellaneous solid wastes. The C and D wastes are used to fill a large ravine. **Calculate percentage of diversion.**   **[12.5 M]**

5. a) Describe various types of incinerations and the factors affecting their efficiency.   [12.5 M]

b) Assume that refuse has the following components and bulk densities:

Component	Percentage (by weight)	Uncompacted bulk density (lb/ft³)
Miscellaneous paper	50	3.81
Garden waste	25	4.45
Glass	25	18.45

Assume that the compaction in the landfill is 1200 lb /yd³ (44.4 lb /ft³). **Estimate the percent volume reduction** achieved during compaction of the waste. **Estimate the overall uncompacted bulk density** if the miscellaneous paper is removed.   [12.5 M]