THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

FIRST SEMESTER EXAMINATIONS – 2022

CEME532 - HAZARDOUS WASTE MANAGEMENT

MASTER IN SOLID WASTE & RESOURCE MANAGEMENT

Thursday 2nd JUNE 2022 – 2:00 PM to 4.00 PM

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. Each question carries equal marks i.e., 10 marks.
6. Assume suitable data wherever necessary.
7. Number of pages is 2 including Cover page.

Que. 1) What is the necessity of waste characterization and characteristics of solid waste?

Que. 2) Discuss the characteristics of hazardous waste, on which it can be categorized as hazardous.

Que. 3) What are the criteria for listing of hazardous waste? Describe various listed hazardous waste.

Que. 4) What are the various classifications and sources of hazardous waste.

Que. 5) Discuss about the storage and transportation of hazardous wastes.

Que. 6) Describe various technologies evolved for hazardous waste management.

Que. 7) Write a note on hazardous waste landfill.

Que. 8) Determine the Higher Heating Value (HHV_d) or Gross Heating Value (GHV) and Lower Heating Values (LHV) or Net Heating Value NHV) for two biomasses at constant volume and constant pressure from their respective ultimate analysis values, which are given as follows:

S.N.	Particulars	Moisture (%)	Ash (%)	C (%)	H (%)	O (%)	N (%)	S (%)	HHV (MJ/kg)
1	Biomass	30	0.75	50.65	6.75	40.85	0.10	0.20	21

Que. 9) A city has a population of 3 lakh (0.3 million) with generation of solid waste @ 0.45 kg/c/d. The organic fraction of waste is found to be 80%. Determine the net power generation potential of the waste if it is converted thermochemically and biochemically. The additional information is as follows: For thermochemical conversion: Conversion Efficiency = 25%, Net Calorific value of SW = 1200 k-cal/kg and for biochemical conversion: Total Organic / Volatile Solids: VS = 50 %, Organic bio-degradable fraction = 66% of VS, Typical digestion efficiency = 60 %, Typical bio-gas yield: B (m^3) = 0.80 m^3 / kg. of VS destroyed, Calorific Value of bio-gas = 5000 kcal/m3 (typical), Conversion Efficiency = 30%.

Que. 10) Write a note on any **TWO** of the following:

1) Basel convention and Rotterdam Convention
2) E-waste management
3) Biomedical waste management
4) Two episodes due to hazardous waste