

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

FIRST SEMESTER EXAMINATIONS – 2022

CEME535: FINAL DISPOSAL / LAND FILLING IN DEVELOPING COUNTRIES

MASTER IN SOLID WASTE & RESOURCE MANAGEMENT

Monday 31st OCTOBER 2022 – 10:00 AM to 12.00 Noon

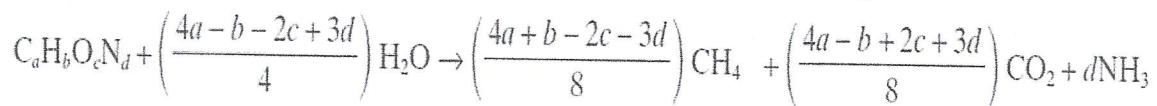
VENUE: PG CLASS ROOM

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. 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)** Write a short note on the three emissions from landfills, their sources and their effects on human health and the environment.
- Que. 2)** Write a short note on any five landfill site selection criteria and state the desirable/recommended attributes a potential landfill site needs to exhibit to be favorably considered.
- Que. 3)** List the typical twenty-landfill construction steps or stages.
- Que. 4)** Write a short note on the three General Categories of Environmental Pollution: quality Monitoring.
- Que. 5)** Write a short note on any 5 activities that shall be covered by a landfill operation plan.
- Que. 6)** Write a short note on any 5 landfill design considerations.
- Que. 7)** Write a short note on landfill gas management.
- Que. 8)** Using the recommended best practice for spacing active vertical landfill gas wells, how many active vertical landfill gas wells are required in a 230m × 160m landfill cell unit.
- Que. 9)** Using equation 1 and 0.0224 m^3 volume occupied by one mole of any gas at STP, compute the volume of the landfill gas that can be generated from the organic constituents of the MSW with the following molecular formula $C_5H_{10}N_2O_3$ at standard temperature and pressure.



- Que. 10)** Using the water balance equation, compute the volume of leachate generated from a 25mm rainfall on a 200m x 150m bioreactor landfill cell using the following data:

1. Recirculated leachate = 100m^3 .
2. Garbage juice = 50m^3 .
3. Water present in landfill waste and all cover and cap layers = 40m^3 .
4. Water loss due to evapotranspiration = 20m^3 .
5. Water loss due to runoff = **50% of rainwater**
6. Water lost through the landfill cap drainage layer = **10% of rainwater**
7. Water retained by landfill = 50m^3 ,
8. Water lost through vaporization of water within the landfill = 20m^3 .
9. Water lost due to the LFG production = 15m^3 .