THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATION - 2021

FOOD TECHNOLOGY - 4TH YEAR DEGREE

FT 432: WATER AND WASTE WATER MONITORING SYSTEM

TUESDAY 2ND NOVEMBER, 2021 – 8:30 AM.

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. You have 10 minutes to read the paper. You must not begin writing in the answer book during this time.
2. **ANSWER ALL QUESTIONS.**
3. All answers must be written on the answer book provided.
4. Write your name and number clearly on the front page. Do it now.
5. Calculators are permitted in the examination room. Notes and textbooks are not allowed.
6. Show all workings and calculations in the answer book.
7. Data required is given on the data sheet.

MARKING SCHEME:

Question 1	[30 marks]
Question 2	[30 marks]
Question 3	[20 marks]
Question 4	[10 marks]
Question 5	[10 marks]

ANSWER ALL QUESTIONS

1. (a) Sugar cane juice comes with mud as a suspension. The juice is to be separated from mud using coagulation and flocculation processes. Discuss how this can be effected. [5 marks]

(b) Why is terminal velocity estimation important in a sedimentation process? Discuss. [5 marks]

(c) An engineer is to design a waste treatment system. What are the three important considerations that must be captured? [6 marks]

(d) Why is fresh meat waste more polluting than human waste? Discuss. [5 marks]

(e) How do "iron-bacteria' and "manganese-bacteria" affect water quality in metal pipes? Discuss. [4 marks]

(f) What is super chlorination? Discuss. [5 marks]

(Total = 30 marks)

2. (a) What is the maximum permissible limits for *E.coli* in potable water for an urban and rural water supply system in PNG? Discuss. [3 marks]

(b) A water systems engineer is assigned to use a nearby creek close to a highly populated village to make water available to potable standard. Discuss how this can be achieved. [7 marks]

(c) Discuss the importance of pH in water treatment. [4 marks]

(d) Discuss the principle of a slow sand filtration in a water treatment system and how it contributes to reduction of microbial population. [5 marks]

(e) What is the most common sterilization technique applied in water treatment? Discuss. [4 marks]

(f) What causes turbidity and how can it be removed? Discuss. [4 marks]

(g) Temperature measurement is one of the test parameters in waste water and water treatment operation. What would an increase in water temperature indicate? Discuss. [3 marks]

(Total = 30 marks)

3. (a) A recent survey indicated that capacity of a flowing creek and a water well was sufficient for a water supply project. My community is wondering which will be a better choice of the two for their water supply project. What will be your choice and advise to the community? Discuss. [6 marks]

(b) I am residing in a location where my only means of fresh water is by use of rain water collected in an open 1000 litres plastic container. How would I make water be potable within the next 24 hours? Discuss. [4 marks]

(c) Compare and contrast between aerobic and anaerobic biological waste management techniques. [4 marks]

(d) Recent studies indicated reduction of aquatic life from what it was like 5 years ago. The investigating team noticed dumping of raw organic wastes into the river by a recently built food processing plant. Laboratory tests showed high BOD levels. Discuss why this unacceptable practice is having negative environmental effect. [6 marks]

(Total = 20 marks)

4. The was a survey done in Tipsit Village in 2020 to design a water supply project to be used in the next 10 years. Below are the findings:

Population:	3000
Growth rate:	2.8%
Primary School	1
Elementary school:	1
Health centre:	1
Safe water yield from source	1 litre per second
NRW:	20% (Public and design population)

Calculate the following assuming that the average daily demand per person is at 20 lpd and public institutions (schools and health centre) use 20% each of design domestic demand.

(i) Deisgn population in year 2030. [2 marks]
(ii) Design domestic demand. [2 marks]
(iii) Public demand (schools, health centre). [2 marks]
(iv) NRW. [2 marks]
(v) Average daily demand. [2 marks]

(Total = 10 marks)

5. (a) What is the base solvent used in dry cleaning? Discuss. [2 marks]

(b) Discuss fully ANY TWO of the five factors that affect cleaning efficiency in a wet cleaning method. [4 marks]

(c) By discussion, differentiate between:

(i) Sterilizer and sanitizer. [2 marks]
(ii) Peptization and saponification. [2 marks]

(Total = 10 marks)

FORMULAR SHEET

1. $P_{future} = P_{present}(1 + GR)^n$ or $GR = (\frac{P_{future}}{P_{precent}})^{\frac{1}{n}} - 1$

2. $AWD(lps) = \frac{Rate\ of\ usage}{1-NRW}$

3. $hp = U^2/2g + h_{lift} + h_{pres} + h_f$

4. $W = hp.G.g$

5. $G = Av\rho$, $Q = Av$

6. $D_p = P_d \times l_d$