BOWEN UNIVERSITY

(OF THE NIGERIAN BAPTIST CONVENTION)

IWO, OSUN STATE.

College of Health Sciences,
Public Health Programme.

1ST SEMESTER EXAMINATION 2023/2024 ACADEMIC SESSION

PUH 201: BIOSTATISTICS

DATE: 27TH JANUARY, 2024 **TIME ALLOWED: 2 HOURS: 30MINS**

INSTRUCTIONS TO CANDIDATES

1. Attempt **ALL** questions
2. All questions attract equal marks.
3. Write your matriculation number LEGIBLY on the answer booklet provided.

1a. What is demography? -2marks

b. With a well-labeled diagram, describe the demographic transition model- 10 marks

c. Using the population age and sex structures to illustrate, compare the shapes of the population pyramid of an economically more developed and that of a less developed country on the following, indicating what demographic variable each stands for;

i. the width of the base of the pyramids

ii. the slope of the pyramids

iii. the height of the pyramids

iv. the area within the pyramids -8 marks

d. List five implications of a population pyramid with a broad-based structure. 5marks

2a. i Define and state the difference between death to case ratio and case fatality rate 5marks

ii A population consists of 1000 people; 300 were diagnosed with diphtheria and 100 of the diagnosed persons died of the disease.

- Calculate the death-to-case ratio, the case fatality rate, the incidence proportion, and the crude death rate. 8 marks
- Provide a mathematical expression to show the relationship, if any, between case fatality, incidence proportion, and the crude death rate. 2 marks

2b. Differentiate between the following terms.

i. De jure and de facto census types

ii. Type 1 and type II errors

iii. Simple random and cluster sampling techniques

iv. Population and sample

v. Infant mortality and neonatal mortality rates –10 marks

3a. A researcher wants to know if a blood pressure medication is effective. Six subjects have their blood pressures recorded. After twelve weeks of medication, the same six subjects had their blood pressures re-recorded. For this test, only systolic pressure is of concern.

Patient	A	B	C	D	E	F
Before	161	162	165	162	166	171
After	158	159	166	160	167	169

i. What type of study design is this? 2 marks
ii. State the null and alternate hypotheses 2 marks
iii. Define an appropriate test statistic and its degree of freedom -4marks
iv. Carry out a test of hypothesis, and state your conclusion at a 5% level of significance, given that the table values of the text statistic at 5, 6, 7, 8, 9, and 10 degrees of freedom are 2.571, 2.447, 2.365, 2.306, 2.262 and 2.228 respectively. –5marks

3b. A pharmaceutical company makes a tranquilizer. The distribution for the time they lasted is assumed to be approximately normal. A hospital researcher used the drug on a random sample of nine patients: The effective period of the tranquilizer for each patient in hours was as follows: 2.7, 2.8, 3.0, 2.3, 2.3, 2.2, 2.8, 2.1, and 2.4.

i. Calculate the mean and the standard deviation of the effective period of the tranquilizer. 4marks
ii. Construct and interpret a 95% confidence interval for the population mean length of time the tranquilizer last given that the critical values of the appropriate text statistic at 5, 6, 7, 8, 9, and 10 degrees of freedom are 2.571, 2.447, 2.365, 2.306, 2.262 and 2.228 respectively- 8marks.

4. A study reported 37 patients admitted for thyroid cancer and 50 controls admitted during the same period for treatment of pneumonia. After the interview, 16 of the thyroid cancer patients were found to have been exposed to X-ray therapy in the past, and only one of the controls reported exposure to X-ray therapy.

a. What study design is this? 2marks

b. Draw a well labelled two by two table to illustrate the data described. 8 marks

c. Define, calculate, and interpret the appropriate measure of association 5marks

d. Using a chi-square test statistic, determine if the association is statistically significant given that the chi-square table values at 1, 2, and 3 degrees of freedom for type 1 error of 0.05 are 3.841,