0140

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2023/2024 – SEMESTER 01
BACHELOR OF PHARMACY HONOURS
BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS
BSU4230 – BASIC STATISTICS – LEVEL 04
FINAL EXAMINATION
DURATION: 2 HOURS

DATE: 27th March 2024 TIME: 9.30 am – 11.30 am

INDEX NO: .....

IMPORTANT INSTRUCTIONS / INFORMATION TO CANDIDATES

- This question paper consists of **05 pages** with **04 Essay Questions**:
- **Essay Questions - (200 marks):** There are 04 essay questions. Write answers in the answer books provided.
- Answer **ALL** questions.
- Write your **Index Number** in the space provided.
- Do NOT bring in on person or have in possession unauthorized materials, including mobile phones and other electronic devices, or violate any other examination rules.
- Do NOT remove any page/part of this question paper from the examination hall.
- **Non-programmable calculators are allowed.**

INDEX NO: .....

Essay Questions

(50 * 4 = 200 Marks)

01.

a) A health researcher is studying the impact of a new dietary supplement on resting heart rate (RHR) in adults. Over a month, he collected the RHR data of 20 participants to analyse the effects. The RHR values were rounded to the nearest beat per minute (bpm) for ease of analysis. Given below is the RHR data points (in bpm):

62, 64, 65, 67, 68, 69, 70, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 83, 65, 77

The table below shows the frequency table of the RHR data.

Resting Heart Rate (bpm)	Frequency (f)	Mid-point (x)	$f * x$
60 - 65	A	E	*I*
66 - 71	B	F	J
72 - 77	C	G	K
78 - 83	D	H	L

i. Determine the values for the letters A-L given in the above table. **(24 marks)**

ii. Calculate the mean resting heart rate of these grouped data. **(6 marks)**

b) A research study on Type 2 Diabetes Mellitus (T2DM) was conducted with a sample of three hundred (300) patients at a health care center. The study aimed to investigate the relationship between various patient characteristics and the management of T2DM. The variables investigated were: Glycated Hemoglobin (HbA1c) Level (%) (Indicates the average level of blood sugar over the past 2 to 3 months, with higher values signifying poorer control of diabetes.), Age (Less than 40 years, 41 to 60 years, above 60 years), Marital Status (Single, Married, Divorced, Widowed), Body Mass Index (BMI) (kg/m^2), Duration of Diabetes (in years) (The length of time since T2DM diagnosis can impact the complexity of management and risk of complications.), Family History of Diabetes (Yes, No), Daily Physical Activity Level (Sedentary, Lightly active, Moderately active, Very active), Number of Diabetic Complications, Dietary Adherence Score (Low, Moderate, Severe), and Blood Pressure (mmHg).

i. For each of the study variables listed, identify the scale of measurement (nominal, ordinal, interval, or ratio). Provide your answers for all eight variables. **(8 marks)**

ii. Determine whether each study variable is qualitative or quantitative. Make sure to categorize all eight variables accordingly. **(8 marks)**

iii. Among the quantitative variables identified in question (b) ii, further classify them as either discrete or continuous. **(4 marks)**

02.

a) A study investigates the effectiveness of a 6-month dietary intervention aimed at reducing cholesterol levels in adults. The following data shows the reduction in LDL cholesterol levels (in mg/dL) among 20 participants at the end of the study:

15, 22, 18, 20, 17, 25, 28, 21, 19, 22, 16, 24, 27, 26, 30, 14, 29, 20, 18, 22

i. Arrange the cholesterol reduction levels in ascending order and construct a stem-and-leaf diagram to visually represent the distribution. **(10 marks)**

ii. Calculate the Median, Mode, First Quartile (Q1), Third Quartile (Q3), and Interquartile Range (IQR) of the given data set. **(10 marks)**

iii. Using the statistical information derived in Part ii, create a box plot to graphically display the distribution of the LDL cholesterol reduction levels among the study participants. **(10 marks)**

b) A university health researcher decides to study the sleep patterns of college students to understand how academic stress affects their sleep quality. To collect data quickly, the researcher decides to distribute questionnaires among students in the university cafeteria during lunch hours, asking students about their sleep habits, stress levels, and academic workload. The choice of location and time is based on the researcher's goal to gather responses in a short period.

i. Identify the sampling technique employed by the researcher for this study. Justify your choice by explaining why this sampling technique is most appropriate for addressing the research problem. **(8 marks)**

ii. List down 3 differences between probability sampling and non-probability sampling methods. **(12 marks)**

03.

a) Researchers are set to assess the outcomes of a novel immunotherapy treatment on a cohort of 40 patients with malignant melanoma. This cutting-edge study involves analysing a comprehensive dataset to determine the therapy's effectiveness in improving survival rates among the patients.

Interval since start of treatments (months)	No. of alive at the start of treatment	Deaths during interval	No. loss to follow-up	No. of persons at risk	Risk of dying during interval	Chance of surviving during interval	Cumulative chance of survival
1	40	4	0				
2	36	5	2				
3	29	1	0				
4	28	6	3				
5	19	4	0				
6	15	2	4				
7	9	4	0				
8	5	5	0				

i. Complete the above table. (Copy the above table into your answer sheet.) **(16 marks)**

ii. Draw the survival curve. **(8 marks)**

iii. Calculate the average length of survival. **(6 marks)**

b) Find the answers to the following questions using the following data set.

9, 10, 5, 4, 2, 8, 7, 4, 9, 10

i. Calculate the mean and the variance of the data set. **(12 marks)**

ii. Compute the coefficient of variation. **(8 marks)**

04.

a) A team of public health researchers is interested in understanding the impact of urban green spaces on the physical activity levels of city dwellers. To gather data, the researchers decide to observe individuals at various urban parks within the city. They record activities such as walking, jogging, playing sports, and other forms of exercise, noting the duration and intensity where possible. The observations are conducted at different times of the day and week to capture a variety of usage patterns. The researchers do not interact with the individuals being observed or alter the environment in any way; they simply record what occurs naturally in these settings.

i. Identify the data collection method that is being employed. **(4 marks)**

ii. Provide 3 differences between quantitative and qualitative research methods. **(6 marks)**

iii. List the ten sequential steps that comprises the research process, providing a clear and concise explanation for each step. **(20 marks)**

b) Suppose a new screening test was done on 400 people, 70 of them were positive in the diagnostic test. The screening test was positive in 60 of the people with the disease as well as in 40 of the people without the disease.

i. Explain the terms Screening test and diagnostic test. **(4 marks)**

ii. Calculate sensitivity, specificity, positive predictive value, and negative predictive value of the screening test. **(16 marks)**

----------END OF QUESTION PAPER----------