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UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

SECOND BPHARM PART I EXAMINATION – JANUARY/FEBRUARY 2023

PH2143 BIOSTATISTICS II - SEQ PAPER

TIME: THREE HOURS

INSTRUCTIONS

- There are six structured essay questions in the paper.
- Answer all questions within the paper itself.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.
- The Z table, Chi square table and the t table are provided.

1.

1.1. List three uses of statistics in Pharmacy practice. ***(30 marks)***

a. .....

b. .....

c. .....

1.2. A pharmacist investigated the prevalence of chronic diseases, hemoglobin (Hg) level and the knowledge on anemia using a sample of 250 adults. Among the participants, there were 80 females and the range of age distribution of the total sample was 34 to 56 years.

1.2.1. Write down one example for each of the following types of variables used in the above research study. ***(20 marks)***

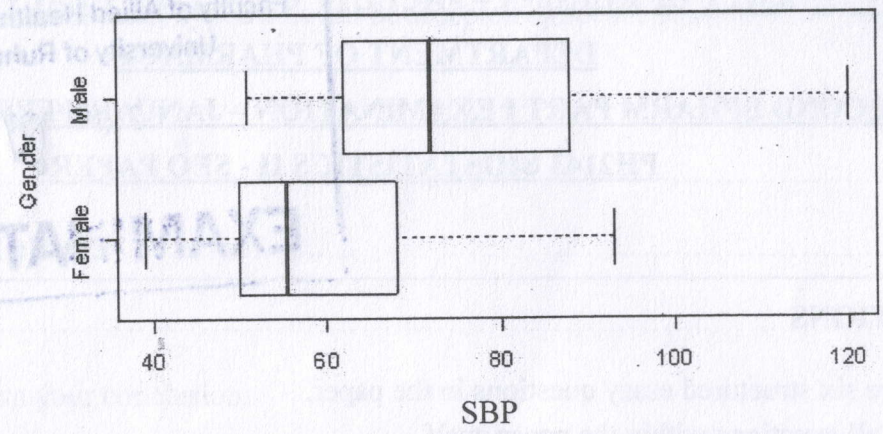
a. Nominal variable .....

b. Binary variable .....

c. Interval scale variable.....

d. Discrete variable .....

1.3. Box and whisker plots of Systolic Blood Pressure (SBP) (mmHg) of a group of young adults attending a health camp is given below.



Answer the question using the figure given above. (Approximate answers are accepted, if the exact answer cannot be observed directly) ***(20 marks)***

1.3.1. What is the upper quartile value of the female group? .....

1.3.2. What is the minimum SPB observed in females? .....

1.3.3. What is the Q_2 value of the male group? .....

1.3.4. What is the Inter Quartile Range (IQR) of the SBP of the male group?

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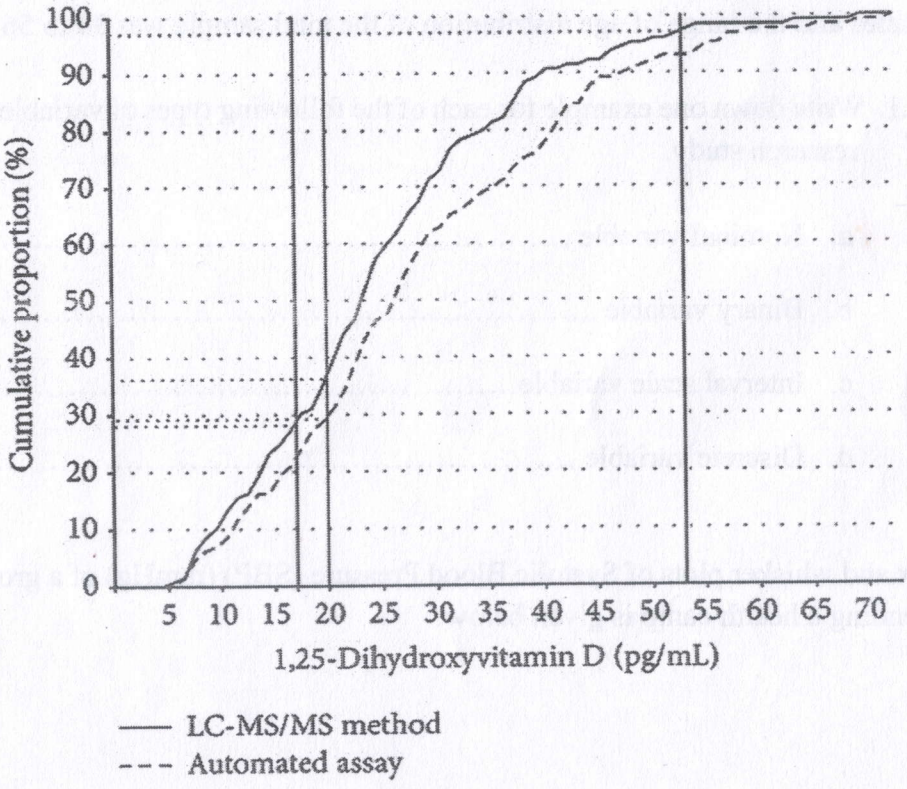
1.4. An ogive showing the percentage of specimen with 1,25-dihydroxyvitamin D concentrations below a certain value according to test procedure. The vertical lines mark different cut-off levels for deficient or harmful 1,25-dihydroxyvitamin D concentrations.



1.4.1. Approximately what percentage of specimen showed harmful 1,25-dihydroxyvitamin D concentrations according to the LC-MS/MS method? (***15 marks***)

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1.4.2. Approximately what percentage of specimen showed 1,25-dihydroxyvitamin D concentration (pg/mL) of 20 – 40 (pg/mL) according to the automated assay method? (***15 marks***)

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2.

2.1. Suppose the occurrence of anemia has no influence on the development of social phobia (Thus the two events can be considered as independent events). Suppose the probability of having anaemia is 0.4 and the probability of having social phobia is 0.8 among school children in Southern Sri Lanka.

2.1.1. What is the probability of having both anemia and social phobia in a randomly selected child from this population? (***15 marks***)

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2.1.2. What is the probability of having either anemia or social phobia or both in a randomly selected school child from this population? (***15 marks***)

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2.2. The number of people arriving at a pharmacy can be modelled by a Poisson distribution with a rate parameter (λ) of 5 per hour.

2.2.1. What is the probability that exactly four arrivals occur during a particular hour? ***(15 marks)***

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2.2.2. What is the probability that at least three people arrive during a particular hour? ***(15 marks)***

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2.3. Suggest **the best sampling method** that can be used to select study participants for each of the following research.

2.3.1. A researcher is interested in identifying the mean serum creatinine level of adults living in Polonnaruwa district. ***(10 marks)***

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2.3.2. A researcher is interested in examining the level of satisfaction of the clients attending a Pharmacy in Galle. ***(10 marks)***

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2.3.3. A researcher is interested in examining personality problems in a group of heroin addicts in an urban slum. ***(10 marks)***

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2.3.4. A researcher is interested in examining Body Mass Index (BMI) of a sample of pregnant women registered in an MOH clinic. (***10 marks***)

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3.

3.1. List three (03) characteristics of a normal distribution. (***15 marks***)

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3.2. Convert the following raw data into Z values. (***20 marks***)

3.2.1. $X = 34$ and $X \sim N(30, 10)$ - .....

3.2.2. $X = 5$ and $X \sim N(2, 1)$ - .....

3.2.3. $X = -5$ and $X \sim N(2, 4)$ - .....

3.2.4. $X = 10$ and $X \sim N(0, 5)$ - .....

3.3. The Body Mass Index (BMI) of a group of diabetes patients ($n = 200$) are normally distributed with the mean of 25 Kg/m^2 and *SD* of 4 Kg/m^2.

3.3.1. How many patients would you expect to be having BMI less than 30 Kg/m^2? (***10 marks***)

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3.3.2. If we define obese as those who are having BMI (Kg/m^2) 30 or more, what proportion of patients in this sample was obese? ***(10 marks)***

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3.4. In a sample of 100 patients with dengue hemorrhagic fever, the mean platelet count was 80, 000 /µl (SD = 10,000 /µl).

3.4.1. Calculate 95% CI of the population mean platelet count? ***(25 marks)***

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3.4.2. How do you interpret this result? ***(20 marks)***

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4.

4.1. A study was conducted using a sample of 100 males to see whether there is a relationship between smoking and high blood pressure. Results are given below.

		Blood Pressure	
		Hypertensive	**Non-Hypertensive**
Smoking	**Yes**	40	20
	No	10	30

4.1.1. State null and alternative hypothesis. (***20 marks***)

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4.1.2. Calculate expected values for the observed values. (***20 marks***)

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4.1.3. Test the null hypothesis at 5% level. (***40 marks***)

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4.1.4. Write your conclusion. ***(20 marks)***

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5.

5.1. Apgar is a quick test performed on a baby at 5 minutes after birth to check how well the baby is doing outside the mother's womb. The scores ranges from 0 to 10. The Apgar score and birth weight of 10 babies are given below.

Apgar Score (Y_i)	Birth Weight (X_i)	X_iY_i	X_i^2	Y_i^2
1	1.5			
3	2.5			
2	2			
4	3			
5	3.5			
3	2			
4	3.5			
3	2			
2	2			
3	3			
$\sum Yi =$	$\sum Xi =$	$\sum XiYi =$	$\sum Xi^2 =$	$\sum Yi^2 =$

5.1.1. What is the independent variable in the above dataset? ***(05 marks)***

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5.1.2. What is the dependent variable in the above data set? ***(05 marks)***

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5.1.3. Calculate, ***(20 marks)***

$\sum Y_i$ .....

$\sum X_i$ .....

$\sum Y_i 2$ .....

$\sum X_i 2$ .....

$\sum X_i Y_i$ .....

5.1.4. Calculate correlation coefficient *(r)* using the following equation. ***(20 marks)***

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2}\sqrt{n(\sum y^2) - (\sum y)^2}}$$

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5.1.5. Interpret *correlation coefficient (r).* **(*10 marks*)**

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5.1.6. Calculate coefficient of determination (R^2). **(*20 marks*)**

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5.1.7. How would you interpret the value you got for the coefficient of determination? **(*20 marks*)**

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6. An Oncologist claims that radiotherapy is more effective than chemotherapy for patients with prostate cancer in increasing survival time. He compared the survival rates of 49 older men who had radiotherapy with 44 older men who had chemotherapy. The mean survival time was 25 months with standard deviation of 4 months for the radiotherapy group and the corresponding figures for the other group were 20 months and of 5 months.

6.1. Write down the null and alternative hypothesis. **(*10 marks*)**

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6.2. Calculate the standard error for the mean difference of two groups using the following equation. **(*20 marks*)**

$$\sqrt{\frac{{\sigma_1}^2}{n_1} + \frac{{\sigma_2}^2}{n_2}}$$

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6.3. Calculate the test statistic to test the null hypothesis mentioned in 6.1. **(*30 marks*)**

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6.4. What is the table value? **(*10 marks*)**

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6.5. Check whether the null hypothesis can be accepted or not at 5% significant level. (***20 marks***)

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6.6. Write down your conclusion. (***10 marks***)

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