

THE OPEN UNIVERSITY OF SRI LANKA

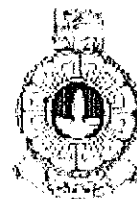
B.Sc. /B.Ed. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS-LEVEL 03

ADU3201/ADU3218/APU1141/ PCU1141 - Basic Statistics

FINAL EXAMINATION 2019/2020

**Duration: Two Hours.**



**Date: 22.12.2019**

**Time: 9.30 a.m- 11.30 a.m**

**Answer four questions only.**

- (1) The manager of a bank recorded the amount of time each customer spent waiting in line during peak business hours on a Monday. The table below summarizes the results.

Waiting time (in minutes)	Number of customers
0-3	10
4-7	13
8-11	12
12-15	5
16-19	7
20-23	1

- (i) Find an estimate for the average waiting time spend by a randomly chosen customer.
  - (ii) Compute the 1<sup>st</sup> quartile. Describe what it measures in relation to this study.
  - (iii) Estimate percentage of customers waiting in line more than 14 minutes.
  - (iv) Construct a suitable graphical summary that can be used to find the shape of the distribution of waiting time.
  - (v) Clearly describe all the findings from the graphical summary constructed in part(iv).
- (2) The rainfall (in mm) recorded in an area on 30 days are given below.

15	23	24	24	25	21	15	13	21	9
6	3	4	4	12	14	15	23	21	12
13	2	14	15	16	24	12	21	24	22

Let  $X$  denote the rainfall (in mm) on a randomly chosen day.

- (i) State whether the random variable  $X$  is a discrete random variable or a continuous random variable.
- (ii) Construct a box plot of the data.
- (iii) Clearly state the findings from the plot constructed in part(ii).
- (iv) Suppose you had constructed a stem and leaf plot of the data instead of a box plot.
- (a) Is there any additional information you could get about the distribution of  $X$ ? If so, clearly state them.
- (b) Is there any information you would have missed? If so, clearly state them.
- (3) A hospital has 300 nurses. During the past year, 48 of the nurses earned a pay raise. At the beginning of the year, the hospital offered a special training seminar which was attended by 138 of the nurses. Twenty-seven of the nurses who earned a raise had attended the training seminar.
- (i) Find the probability that a nurse who attended the seminar earned a pay raise.
- (ii) If a nurse is selected at random, find the probability that this nurse had attended the seminar and earned a pay raise.
- (iii) Find the probability that a nurse who earned a pay raise had attended the training seminar.
- (iv) Find the probability that a nurse who earned a pay raise had not attended the training seminar.
- (4) Department of police of a certain country has collected the data described below from 62 police divisions to identify the factors that could affect the crime rate of a division.
- $V_1$  : Crime Rate (Number of offences per 1000 people)
- $V_2$  : Average schooling of people in the division (in years)
- $V_3$  : Number of families receiving food subsidies from the government per 1000 people
- $V_4$  : Average monthly income
- $V_5$  : Type of the division (1- Urban, 2- Semi-urban, 3- Rural)
- (i) Classify the variables as qualitative or quantitative.
- (ii) Classify the quantitative variables as discrete or continuous.
- (iii) Classify the data as nominal, ordinal, interval or ratio.

- (iv) State whether each of the following statement is true or false. Give reasons for your answer.
- A cumulative frequency polygon is appropriate for summarizing the information collected on the variable  $V_1$ .
  - A line chart is suitable for summarizing the information collected on the variable  $V_4$ .
  - A pie chart is suitable to present the information collected on the variable  $V_5$ .

- (5) The number of telephone calls received in an office during lunch hour ( $X$ ) has the probability mass function given below.

Number of calls ( $X$ )	0	1	2	3	4	5	6
$P(X=x)$	0.05	0.20	0.25	0.20	0.15	0.10	0.05

- Verify that the given function is really a probability mass function.
- Find the probability that there will be three or more calls.
- Find the probability that there will be an odd number of calls.
- Find the expected value of  $X$ . In relation to this study, what does it measure?
- Find the standard deviation of  $X$ . In relation to this study, what does it measure?

- (6) A player tosses a fair coin at most 5 times. If the head turns up, the player wins Rs.10/-. If the tail turns up the player loses Rs. 10/-. The player begins with Rs. 10/- and will stop playing before 5 tosses if he loses all his money.

Let  $X$  denotes the amount of money of the game on a random play.

- Construct a tree diagram that clearly indicates the amount of money that the player has for each possible outcome of a random play.
- Write down the sample space of  $X$ .
- Find the probability that the player stops the game by loosing all his money.
- Find the probability that the amount of money that the player has is more than Rs.30.

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