EASTERN UNIVERSITY, SRI LANKA

FACULTY OF SCIENCE

Second Year First Semester Examination in Science - 2021/2022

(March/April, 2024)

MT 2232 - STATISTICS

Answer all questions

Time : Two hours

Calculator and Statistical table will be provided

1. (a) Marks (out of 50) of students in a class for a course unit, have been summarized as shown in table below.

Marks	$0 < X \leq 10$	$10 < X \leq 20$	$20 < X \leq 30$	$30 < X \leq 40$	$40 < X \leq 50$
Frequency	10	20	30	25	15

    i. Find the mean, median and mode of marks. [45 marks]

    ii. Find the coefficient of variation of the marks. [10 marks]

    iii. Comment on the symmetry of the distribution of the marks by using Pearson's second coefficient of skewness. [10 marks]

(b) Janet is researching phones and decides to create a weighted average to determine the best. She uses the following weights: 50% for battery life, 30% for cost and 20% for camera quality to calculate a score for each phone. She uses internet based reviews to determine her ratings out of 10 for each category. Determine which phone she should buy based on her ratings. [35 marks]

Category	Battery Life	Cost	Camera quality
Weight	50%	30%	20%
iphone	9	7	9
Samsung	9	7	7
Vivo	8	9	7

2. A researcher wants to find the relationship between two variables X and Y. He has collected the following data:

X	10	12	16	11	15	14	20	22
Y	15	18	23	14	20	17	25	28

(a) By using a suitable measure, comment on the linear relationship between X and Y. Test the significance of the relationship at 5% significance level. [30 marks]

(b) Fit a regression model of the form of $Y = \beta_0 + \beta_1 X$. [10 marks]

(c) Update the model after testing the significance of parameters β_0 and β_1 at 5% significance level. [40 marks]

(d) Estimate the value of Y when the value of X is 6. [10 marks]

(e) Find the coefficient of determination and interpret it. [10 marks]

3. (a) There are four fused bulbs and 10 good bulbs in a lot. If three bulbs are drawn at random with replacement, find the probability of

    i. getting one fused bulb;

    ii. getting more than one fused bulb. [30 marks]

(b) On a typical weekday morning customers arrived a village post office independently at a rate of 3 per 10 minutes period. Find the probability that

    i. at least 4 customers arrive in the next 10 minutes;

    ii. no more than 7 customers arrive between 11.00 am and 11.30 am. [30 marks]

(c) Kevin uses his mobile phone for X minutes each day. X is a random variable which may be modelled by a normal distribution with mean 28 minutes and standard deviation 8 minutes. Find the probability that on a particular day Kevin uses his mobile phone for:

    i. less than 30 minutes;

    ii. more than 16 minutes;

    iii. between 10 and 20 minutes. [40 marks]

4. (a) For testing the hypothesis $H_0 : \mu \geq 25$ vs $H_1 : \mu < 25$, a sample from a normally distributed population has been taken. Test the hypothesis at 5% significance level by using the following summarized data of the sample, given with the usual notations:
$n = 10$; $\overline{X} = 22$; $S^2 = 12$. [40 marks]

(b) It has been claimed by a drug manufacturing company that recently introduced tablet can reduce human's sugar level. A doctor works at a hospital has recorded sugar levels (in mg/dL) of 10 diabetes patients before and after giving the tablets. Data are given below. Test the claim at 5% significance level by assuming that human sugar level follows a normal distribution.

Before	140	150	125	130	125	145	110	115	110	115
After	120	115	115	125	120	130	105	120	110	115

[60 marks]