Answer all questions

Calculator and Statistical tables will be provided

Time : Two hours

1. (a) Marks of students in a class for a particular subject are given below:

    6, 7, 8, 15, 18, 19, 20, 22, 23, 27, 28, 30, 32, 34, 36, 38, 39, 39, 40, 50.

    i. Construct a box plot for the above data and discuss the skewness of the distribution of marks.

    [30 marks]

    ii. Find the mean, median and mode of marks by preparing the frequency table with the following intervals:

    $(0 < X \le 10,\ 10 < X \le 20,\ 20 < X \le 30,\ 30 < X \le 40,\ 40 < X \le 50)$

    [30 marks]

(b) Three students (X, Y, Z) followed an special degree program and their grade point averages(GPA) in each year of study are given in the following table with corresponding weights. An award will be given to the student who shows the highest weighted GPA at the end of the degree program. Find the student/students who is/are eligible for this award.

Year of Study	1	2	3	4
Weights	10%	20%	30%	40%
Student - X	3.5	2.8	3.7	3.3
Student - Y	3.8	3.0	3.1	2.3
Student - Z	2.9	2.8	3.5	3.8

[40 marks]

2. With the intention of finding the relationship between two variables X and Y, a student collected the data given in the following table:

X	5	10	15	20	25	30	35	40
Y	11	19	33	38	53	65	71	78

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

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

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

(d) Find the prediction error for $X = 10$. [10 ma

(e) Find the percentage of variation that covered this model. [10 ma

3. (a) It has been found that success rate of a particular test for pregnancy is 70%. I pregnant women have been tested, what is the probability that at least 3 pregn women get negative results for pregnancy? [25 ma

(b) An engineer responsible for the maintenance of a certain machine in a company found that there will be 5 breakdowns, on average, within a period of one month. F the probability that machine will breakdown at most 2 times in a week consider Assume average breakdown is proportional to the period. [25 ma

(c) Life time of newly introduced CFL bulbs is normally distributed with a mean life ti of 1000 hours and variance of 400 hours. If a bulb is selected randomly, what is probability that life time of that selected bulb is:

    i. less than 950 hours;

    ii. more than 980 hours;

    iii. less than 1020 hours;

    iv. between 960 and 1060 hours. [50 mar

4. (a) A company manufacturing milk powder that average weight of a milk powder tin is 400g. To check the claim, a student has collected a random sample of 5 milk power tins from the company and has measured the weight that are 400g, 420g, 380g, 410g and 405g. Check the validity of the claim given by the manufacturer at 5% significance level.

[50 marks]

(b) An institute has collected the following marks (ranging from 0 to 5) from 10 partici-pants, before and after the training program, with the purpose of testing whether the training program is effective. Perform a suitable hypothesis test and give your conclu-sion on the effectiveness of the training program at 5% significance level, assuming that the marks follow a normal distribution.

| Marks | Before Training | 1.2 | 1.8 | 1.3 | 1.5 | 1.6 | 2 | 1.9 | 1.7 | 1.4 | 1.1 |
| | After Training | 1.5 | 1.8 | 1.5 | 1.8 | 2 | 2.1 | 2 | 1.9 | 2.4 | 1.6 |

[50 marks]