n= 25, ΣX= 25, ΣX^2= 650, ΣY=100, ΣY^2= 460, ΣXY= 580

It was however later discovered at the time of checking that he had copied down two pairs as

X	Y
6	14
9	6

While the correct values were

X	Y
8	12
6	8

Obtain the correct value of correlation coefficient. 7

(b) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and the sons (Y) : 7

X	65	66	67	68	69	70	72	72
Y	67	68	65	68	71	72	64	70

10. (a) Obtain the equations of two lines of regression for the following data. Also obtain the estimate of X for Y= 70. 8

X	65	66	67	68	69	70	72	72
Y	67	68	65	68	71	72	64	70

(b) Define Regression coefficients. Write all the properties of Regression Coefficients. 6

****

UG Even Semester Examination, September, 2023

COMPUTER SCIENCE

(2nd Semester)

Course No.: MCSCC-202

(Statistical Methods and Applications)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

The figures in the margin indicate full marks for the questions.

Answer any five questions, taking one from each unit.

UNIT-I

1. (a) A box containes 6 white, 4 red and 9 black balls. If 3 balls are drawn are at random, find the probability that : (i) two of the balls drawn are white, (iii) one is of each colour, (iii) none is read, (iv) at least one is white. 5

(b) The probability that student passes a Physics test is 2/3 and the probability that he passes both a Physics test and an English test is 14/45. The probability that he passes at least one test is 4/5. What is the probability that he passes the English test? 4

(c) Three newspapers A, B and C are published in a certain city. It is estimated from a

survey that of the adult population : 20% read A, 16% read B, 14% read C, 8% read both A and B, 5% read both A and C, 2% read all three. Find what percentage of adult population read at least one of the papers? 5

2. (a) For any three events A, B and C, prove that

(i) $P(A \cup B)|C = P(A|C) + P(B|C) - P(A\ B|C)$

(ii) $P(A\ \bar{B}|C) + P(A\ B|C) = P(A|C)$ 5

(b) The odds that person X speaks the truth are 3:2 and the odds that person Y speaks the truth are 5:3. In what percentage of cases are they likely to contradict each other on an identical point. 5

(c) If four squares are chosen at random on a chess-board, find the chance that they should be in a diagonal line. 4

UNIT-II

3. (a) Suppose that a product is produced in three factories X, Y and Z. It is known that factory X produces thrice as many items as factory Y, and the factories Y and Z produce the same number of items. Assume that it is known that 3 percent of the items produced by each of the factories X and Z are defective, while 5 percent of those manufactured in Y are defective. All the items produced in three factories are stocked, and an item of product is selected at random :

(i) What is the probability that this item is defective?

(b) A department in a works has 10 machiens which need adjustment from time to time during the day. Three of these machines are old, each having a probability of 1/11 of needing adjustment during the day, and 7 are new, having corresponding probabilities of 1/21.

Assuming that no machine needs adjustment twice on the same day, determien the probabilities that on a particular day:

(i) Just 2 old and no new machines need adjustment

(ii) If just 2 machines need adjustment, they are of the same type. 7

8. (a) Define Poisson distribution. Show that Poisson distribution if the limiting case of Binomial distribution under some conditions. 7

(b) Six coins are tossed 6400 times. Using the Poisson distribution, find the approximate probability of getting six heads 50 times. 4

(c) In a book of 520 pages, 390 typ-graphical errors occur. Assuming Poisson law for the number of errors per page, find the probability that a random sample of 5 pages will contain no error. 3

UNIT-V

9. (a) A computer while calculaing correlation coefficient between two variables X and Y from 25 pairs of observations obtained the following results :

(ii) If an item is selected at random is found to be defective, what is the probability that it was produced by factory X, Y and Z respectively? 7

(b) State and prove Baye's theorem. 7

4. (a) Two dice are rolled. Let X denote the random variable which counts the total number of points on the upturned faces. Construct a table giving the non-zero values of the probability mass function and draw the probability chart. Also find the distribution function of X. 7

(b) Let X be a continuous random variable with probability density function :

$$f(x) = \begin{cases} ax, & 0 < x < 1 \\ a, & 1 < x < 2 \\ -ax + 3a, & 2 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

(i) Determine the constant a, (ii) Compute $P(X<1.5)$ 7

UNIT-III

5. (a) Define marginal probability function and conditional probability function. 4

(b) A two dimensional random variable (X, Y) have a joint probability mass function:

$$p(x,y) = \frac{2x+y}{27}, \text{ for } x = 0, 1, 2, 3 \text{ and } y = 0,1$$

Find the conditional distribution of Y for =x. 5

(c) For the joint probability distribution of two random variables X and Y given below:

X \ Y	1	2	3	4
1	4/36	3/36	2/36	1/36
2	1/36	3/36	3/36	2/36
3	5/36	1/36	1/36	1/36
4	1/36	2/36	1/36	5/36

Find (i) the marginal distribution of X and Y, (ii) conditional distribution of X given the value of Y=1. 5

6. (a) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them. 4

(b) A coin is tossed until a head appears. What is the expectation of the number of tosses required? 5

(c) In four tosses of a coin, let X be the number of heads. Tabulate the 16 possible outcomes with the corresponding values of X. By simple counting, derive the probability distribution of X and hence calculate the expected value of X. 5

UNIT-IV

7. (a) In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or better of completely destroying the target? 7