(c) Define, random variable, distribution function and probability density function. 3

6. (a) Let X be a continuous random variable with p.d.f.

$$f(x) = \begin{cases} ax + 1, & 0 \le x < 1 \\ a - 1, & \text{if } 1 \le x < 2 \\ ax + 4a, & \text{if } 2 \le x < 3 \\ 0, & \text{elsewhere} \end{cases}$$

(i) Determine the constant 'a'

(ii) Compute $P\{X \le 2\}$ 6

(b) The diameter of an electric cable, say X, is assumed to be a continuous random variable with p.d.f.,

$$f(x) = 6x(1 - x), \quad 0 \le x \le 1,$$

(i) Check that the above function is a p.d.f.

(ii) Determine a number 'b' such that,

$P(X < b) = P(X > b)$ 4

(c) A continuous random variable X has the probability density function, $f(x) = A + Bx$, $0 \le x \le 1$, if the mean of the distribution is $\frac{1}{2}$, find A and B. 4

UNIT - IV

7. (a) A coin is tossed until a head appears. What is the expectation of the number of tosses required? 7

(b) Define mathematical expectation. Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them. 7

UG EVEN SEMESTER (CBCS) EXAMINATION, SEPTEMBER - 2021

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 committee of 4 people is to be appointed from 4 officers of the production department, 3 officers of the purchase department, 3 officers of the of the sales department and 1 chartered accountant. Find the probability of forming the committee in the following manner:

i) There must be one from each category

ii) It should have at least one from the purchase department

iii) The chartered accountant must be in the committee. 7

(b) If the letters of the word 'REGULATIONS', be arranged at random, what is the chance that there will be exactly 4 letters between R and E? 7

2. (a) Prove that in a single throw with a pair of dice the probability of getting the sum of 7 is equal to 1/6 and the probability of getting the sum of ten is equal to $\frac{1}{12}$. 4

(b) Two card is drawn from a pack of 52 cards. What is the chance that

(i) they belong to the same suit?

(ii) they belong to different suits and different denominations. 4

(c) For any three events A, B and C, prove that

$P(A \cup B \mid C) = P(A \mid C) + P(B \mid C) - P(A \cap B \mid C)$ 6

UNIT - II

3. (a) A problem in statistics is given to the three students A, B and C, whose chances of solving it are $\frac{1}{3}$, $\frac{2}{5}$ and $\frac{3}{5}$ respectively.

What is the probability that the problem will be solved if all of them try independently? 7

(b) The odds against manager X, setting the wage dispute with the workers are 8:6 and odds in favour of manager Y setting the same dispute are 14 : 16.

(i) What is the chance that neither settles the dispute, if they both try, independently of each other?

(ii) What is the probability that the dispute will be settled? 7

4. (a) 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. 7

(b) A and B throw alternately with a pair of ordinary dice. A wins if he throws 6, before B throws 7, and B wins if he throws 7 before A throws 6. If A begins, show that his chance of winning is $\frac{30}{61}$. 7

UNIT - III

5. (a) A random variable X assumes the values -3, -2, -1, 0, 1, 2, 3, such that

$P(X = -3) = P(X = -2) = P(X = -1)$

$P(X = 1) = P(X = 2) = P(X = 3)$

and $P(X = 0) = P(X < 0) = P(X > 0)$

obtain the probability mass function of X and its distribution function. 5

(b) A random variable X has the following probability distribution:

x :	0	1	2	3	4	5	6	7	8
p(x) :	a	2a	5a	4a	3a	6a	2a	3a	a

(i) Determine the value of a

(ii) Find $P(X < 3)$, $P(X \geq 3)$ and $P(0 < X < 5)$

(iii) What is the smallest value of x, for which $P(X \leq x) > \frac{2}{3}$?

(iv) Find out the distribution function of X ? 6

8. (a) Let X be a random variable with the following probability distribution : 5

x :	- 3	6	9
P (X = x) :	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find E (X), E (X^2) and using the laws of expectation, evaluate E $(2X + 1)^2$.

(b) Six coins are tossed 6,400 times. Using the Poisson distribution, find the approximate probability of getting six heads 20 times. 5

(c) If X and Y are independent Poisson variates such that

P (X = 1) = P (X = 2)

and P (Y = 2) = P (Y = 3)

Find the variance of X - 2Y. 4

UNIT - V

9. (a) Show that the correlation coefficient is independent of change of origin and scale. 7

(b) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads. 7

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

$n = 25, \quad \Sigma X = 125, \quad \Sigma X^2 = 650,$

$\Sigma Y = 100, \ \Sigma Y^2 = 460, \ \Sigma XY = 508$

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

X	Y
6	14
8	6

While the correct values were

X	Y
8	12
6	8

Obtain the correct value of correlation coefficient. 8

10. (b) After correcting 50 pages of the proof of a book, the proof reader finds that there are, on an average, 2 errors per 5 page. How many pages would one expect of find with 0, 1, 2, 3 and 4 errors, in 1000, pages of the first print of the book?
(Given that $e^{-0.4} = 0.6703$) 6