

s. No. of Question Paper

: 6175

Roll No.....

Unique Paper Code

: 62357503

Name of Paper

: DSE-Statistics

Name of Course

: CBCS B.A. (PROG)

Semester

: V

Duration

: 3 Hours

Maximum Marks

: 75 Marks

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **two** parts from each question.
3. All questions are compulsory.
4. Calculator is allowed.

1. (a) Use the axioms of probability to prove:

i) $P(A^c) = 1 - P(A)$

ii) $P(A \cap B^c) = P(A) - P(A \cap B).$

(3+3.5)

- (b) If A, B, C are mutually independent events, prove that A and $B \cup C$ are independent.
(6.5)

- (c) In a lock producing factory, there are 3 machines I, II, III which respectively produce 500, 300, and 200 locks daily. Of their product, 1%, 2% and 5% respectively are defective. A lock was picked at random and found to be defective. What is the probability that it was produced by machine III ?
(6.5)

2. (a) From the following distribution:

x	-2	-1	0	1	2
p(x)	0.1	0.2	0.4	0.2	0.1

Find (i) $E(X)$ (ii) $E(X^2)$ (iii) $E[(X+2)^2]$. (2+2+2)

- (b) The first three moments of a distribution about the value 5 are 2, 20 and 40. Find the mean, variance and μ_3 . (6)

- (c) If X is a continuous random variable with probability density function

$$f(x) = \begin{cases} kx(1-x), & 0 \leq x \leq 1, \\ 0, & \text{elsewhere} \end{cases}$$

Find (i) the value of k , (ii) $E\left(\frac{1}{x}\right)$. (3+3)

3. (a) Obtain the moment generating function of the Poisson distribution. Hence find its mean. (4+2.5)

- (b) If X follows Exponential distribution, prove $P[X \geq t + t_0 | X \geq t_0] = P[X \geq t]$.
(6.5)

- (c) If X follows Normal distribution with mean 30 and standard deviation 5, find
(i) $P[X > 35]$ (ii) $P[|X - 30| \leq 6]$. (3+3.5)

4. (a) Two random variables have the following joint density function:

$$f(x, y) = \begin{cases} \frac{1}{8}(4 - x - y), & 0 \leq x \leq 2, 0 \leq y \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find (i) the marginal density of X ,

(ii) the conditional density of Y , given $X = 1$.

(4+2.5)

(b) The tip percentage at a cafe has a mean value of 18% and a S.D. of 6%. What is the approximate probability that the mean tip percentage for a random sample of 40 bills is between 16% and 19%.

(6.6)

(c) If the lines of regression are $X + 2Y = 5$ and $2X + 3Y = 8$,

Find (i) the mean values of X and Y

(ii) the correlation coefficient r . (3+3.5)

5. (a) The mean height of a sample of 100 students taken from a large population is 64 inches with a S.D. of 4 inches. Can it be reasonably regarded that the mean height of the population is 66 inches.

(6)

(b) The following are the lengths (in inches) of a sample of 12 cotton tapes taken from a large consignment 48, 46, 49, 46, 52, 45, 43, 47, 47, 46, 47, 50. Test the hypothesis that the mean length of the consignment is 47 inches. (Given $t(0.05)$ for 11df is 2.2)

(6)

(c) Test whether smoking causes cancer on the basis of the following information about 50 senior citizens:

	Got cancer	No cancer
Smokers	8	12
Non-smokers	5	25

(6)

(Given $\chi^2(0.05)$ for 1df is 3.84)

6. (a) Eleven students were given a statistics test. They were given two months coaching and then given a second test. Marks obtained are given below:

Students	1	2	3	4	5	6	7	8	9	10	11
I st test	23	20	19	21	18	20	18	17	23	16	19
II nd test	24	19	22	18	20	22	20	20	23	20	18

Discuss whether this coaching is beneficial for students. (Given $t(0.05)$ for 10df is 2.228)

(6)

(b) A dice is tossed 6000 times and a throw of 6 is obtained 1050 times. Discuss whether the dice may be regarded as unbiased.

(6)

(c) A theory predicts that the proportion of beans in 4 groups A, B, C, D is 11: 4: 3: 2. In an experiment, it was observed that the numbers were 1070, 430, 330, 170 respectively. Does the experiment support the theory. (Given $\chi^2(0.05)$ for 3df is 7.815)

(6)