(c) A certain stimulates given to each of 12 patients resulted in the following increase of B.P:

5, 2, 8, −1, 3, 0, −2, 1 5, 0, 4, 6.

Can it be concluded that the stimulates will, in general, result in an increase of B.P. (Given that tabulated t(0.05) for 11 df is 2.2).   (6.5)

6. (a) Examine whether the following sample could have come from a population with mean 15:

16, 18, 13, 11, 20, 22, 17, 19, 18, 15

(Given that tabulated t(0.05) for 9 df is 2.262).

          (6)

(b) The theory predicts that the proportion of beans in 4 groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the 4 groups were 882, 313, 287 and 118. Does the experiment support the theory? (Given tabulated Chi-square(0.05) for 3 df is 7.81).   (6)

(c) Test whether smoking causes cancer on the basis of the given information about 24 senior citizens:

	Got cancer	No cancer	Total
Smokers	4	8	12
Non-Smokers	2	10	12
Total	6	18	24

(Given that tabulated Chi-square(0.05) for 1 df is 3.84).   (6)

          (1500)
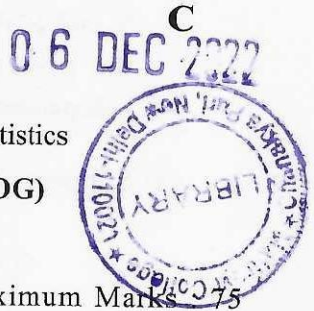
Instructions for Candidates

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 and carry equal marks.

1. (a) What is the expectation of the number of failures preceding the first success in an infinite series of independent trials, with constant probability p of success in a trial.   (6.5)

(b) If A and B are two events such that P(A) > 0 and P(B) ≠ 1, then prove that

$$P\left(A^c \middle| B^c\right) = \frac{1 - P(A \cup B)}{P(B^c)}.$$ (6.5)

P.T.O.

(c) A problem of statistics is given to three students A, B And C, whose chances of solving it are ½, ¾ and ¼ respectively. What is the probability that the problem will be solved if all of them try independently. (6.5)

2. (a) Suppose X has pdf defined as :

$$f(x) = \begin{cases} cx^3 & 0 < x < 7 \\ 0 & \text{elsewhere} \end{cases}$$

   (i) Find c.
   (ii) Find $P(1/4 < X < 1)$. (6)

   (b) Prove that $V(aX + b) = a^2 V(X)$ and $\sigma_{aX} = |a| \cdot \sigma_X$. (6)

   (c) In a bolt factory there are four machines A, B, C, D manufacturing 20%, 15%, 25% and 40% of the total output respectively. Of their total outputs 5%, 4%, 3% and 2% in the same order are defective bolts. A bolt is chosen at random from the factory's production and is found to be defective. What is the probability that bolt was manufactured by machine B or machine C. (6)

3. (a) Obtain the Moment Generating Function of the Poisson Distribution. Hence obtain its mean. (6.5)

   (b) If 20% of college students are smokers, find the probability that in a group of 5 college students (i) exactly 2 are smokers (ii) at least 2 are smokers. (6.5)

(c) The life-time (in hours) of a certain equipment has normal distribution with mean 80 and standard deviation 16. Find the probability that the equipment lasts (i) at least 100 hours (ii) at most 70 hours. (6.5)

4. (a) For the joint distribution given by the pdf

$$f(x,y) = \begin{cases} \dfrac{6}{5}(x + y^2) & 0 < x < 1, 0 < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$

   Find (i) the marginal distributions
        (ii) $P(1/4 < Y < 3/4)$. (6)

   (b) The amount of impurity in one batch of a chemical product has mean 4 gm and standard deviation 1.5gm. What is the probability that the average $\overline{X}$ of 50 batches is between 3.5 gm and 3.8 gm? (6)

   (c) Let the lines of regression be $3X + 12K = 19$ and $3Y + 9X = 46$. Find (i) the mean values of X and Y, (ii) the correlation coefficient $\rho(X,Y)$. (6)

5. (a) A sample of 400 individuals is found to have a mean height of 67.47 inches. Can it be regarded as drawn from a population with mean 67.39 inches and standard deviation 1.3 inches. (6.5)

   (b) A dice is thrown 9000 times and a throw of 3 or 4 observed 3220 times. Can the dice be regarded as unbiased? (6.5)

P.T.O.