[This question paper contains 4 printed pages.]

4697 Your Roll No. ....

B.Sc. (G)/III AS

MATHEMATICAL SCIENCES (STATISTICS)

Paper VI (ii) – Statistics

Time : 3 Hours *Maximum Marks : 55*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any **two** *parts from each question. Symbols have their usual meanings.*

1. (a) For a distribution, mean is 10, variance is 16, $\gamma_2 = +1$ and $\beta_2 = 4$. Obtain the first three moments about origin. (4½)

   (b) The mean of 5 observations is 4.4 and the variance is 8.24. If three of the five observations are 1, 2 and 6, find the other two. (4½)

   (c) In a frequency distribution, the coefficient of skewness based on quartiles is 0.4. If the sum of uper and lower quartiles is 80 and median is 36.Find the values of the upper and lower quartiles. (4½)

P.T.O.

2. (a) A bag contains n white and n red balls. Pair of balls are drawn without replacement until the bag is empty. Show that the probability that each pair of balls consisting of one white and one red ball, is $2^n/{}^{2n}C_n$. (4½)

(b) If A and B are independent events and $P(A) = P(B) = \frac{1}{2}$. Find $P\left(A\bar{B} \cup \bar{A}B\right)$ where $\bar{A}$ and $\bar{B}$ denote the complements of A and B. (4½)

(c) A random variable x assumes any positive integral value n with a probability proportional to $\frac{1}{3^n}$. Find the expected value of x. (4½)

3. (a) In a precision bombing attack there is 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 ? (4½)

(b) If X and Y are independent Poisson variates with means 1 and 3 respectively. Find the mean and variance of $3X + Y$. (4½)

(c) If X and Y are two independet Poisson variates with mean 1 and 2 respectiely. Show that $P(X + Y < 4) = 13e^{-3}$. (4½)

4. (a) For the distribution

$$dF = x(2-x), \quad 0 \le x \le 2$$

find the mean and mean deviation about mean. (4½)

(b) For the normal distribution $N(\mu, \sigma^2)$, prove that

$$\mu_{2r+2} = \sigma^2 \mu_{2r} + \sigma^3 \frac{d\mu_{2r}}{d\sigma}.$$ (4½)

(c) Show that the mean deviation about the mean of the normal distribution is $\sigma\sqrt{\frac{2}{\pi}}$. (4½)

5. (a) If x, y, z are three variables each with variance σ^2 and correlation coefficient between any two of them is r and if $\overline{X} = \frac{1}{3}(x+y+z)$, show that $\text{var } \overline{X} = \frac{\sigma^2}{3}(1+2r)$ and hence deduce that $r \ge -\frac{1}{2}$. (4½)

(b) Given $N = 50$, $\bar{y} = 44$, $\sigma_x = \frac{3}{4}\sigma_y$. Regression equation of x on y :

$$3y - 5x = -180$$

Find the mean of x and correlation coefficient between x and y. (4½)

(c) Fit a straight line to the data :

x :	0	1	2	3	4
y :	1	1.8	3.3	4.5	6.3

(4½)

6. (a) In two large populations there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations. (5)

(b) The heights of six randomly chosen soldiers are (in inches) : 63, 65, 68, 69, 71, 72. Those of nine the randomly chosen sailors are 61, 62, 65, 69, 69, 70, 71, 72, 73. Discuss in the light of these data that sailors are, on the average, taller than the soldiers.

[Given : $t_{0.05}(15) = 2.13$, $t_{0.05}(14) = 2.14$ and $t_{0.05}(13) = 2.16$] (5)

(c) 300 digits were chosen at random and found to give the following distribution :

Digit :	0	1	2	3	4	5	6	7	8	9
Frequency :	18	32	28	34	42	50	17	23	27	29

Test the hypothesis that the digits were distributed in equal numbers in the table from which the data was collected.

(Given that $\chi^2_{0.05}$ for 9 d.f. = 16.92) (5)