[This question paper contains 4 printed pages.]

2513 *Your Roll No.* .....

B.Sc. (G)/III **A**

MATHEMATICS – 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 Section.*

SECTION I

1. (a) The mean age of a combined group of men and women is 25 years. If the mean age of the group of men is 26 and that of the group of women is 21. Find the percentage of men and women in the group. (4½)

   (b) Show that for a discrete distribution, $\beta_2 \geq 1$. (4½)

   (c) If a variable X takes the values 0, 1, 2, ---, n with frequencies, 1, ${}^nC_1$, ${}^nC_2$, ---, ${}^nC_n$ respectively, show that the mean square deviation about origin is $\frac{n(n+1)}{4}$ and standard deviation is $\frac{\sqrt{n}}{2}$. (4½)

P.T.O.

SECTION II

2. (a) A and B take turns in throwing two dice, the first to throw 9 being awarded the prize. Show that if A has the first throw, their chances of winning are in the ratio 9 : 8. (4½)

(b) An urn A contains 2 white and 4 black balls. Another urn B contains 5 white and 7 black balls. A ball is transferred from the urn A to the urn B. Then a ball is drawn from the urn B. Find the probability that it will be white. (4½)

(c) Two unbiased dice are thrown. Find the expected value of the sum of numbers of points on them. (4½)

SECTION III

3. (a) If m things are distributed among 'a' men and 'b' women, show that the probability that the number of things received by men is odd, is

$$\frac{1}{2}\left[\frac{(b+a)^m-(b-a)^m}{(b+a)^m}\right] \qquad (4\frac{1}{2})$$

(b) Derive Poisson's distribution as a limiting case of the Binomial distribution. (4½)

(c) Show that in a Poisson distribution with unit mean, the mean deviation about mean is $\left(\frac{2}{e}\right)$ times the standard deviation. (4½)

SECTION IV

4. (a) If X and Y are two independent normal variates with parameters μ_1, σ_1^2 and μ_2, σ_2^2 respectively. Show that $X + Y$ is also a normal variate with parameters $\mu_1 + \mu_2$ and $\sigma_1^2 + \sigma_2^2$. (4½)

(b) Find the value of k such that

$$f(x) = \begin{cases} kx^2 & , 0 < x < 1 \\ 0 & , \text{elsewhere} \end{cases}$$

is a probability density function. Also find the mean and $P\left(\frac{1}{3} \le x \le \frac{1}{2}\right)$. (4½)

(c) For a normal distribution, the first moment about 8 is 22 and the fourth moment about 30 is 27. Find the mean and variance of the distribution. (4½)

SECTION V

5. (a) Show that the correlation coefficient r between two variables lies between -1 and 1. (4½)

(b) Two random variables have the least square regression lines $3x + 2y = 26$ and $6x + y = 31$. Find the mean values $\bar{x}$ and $\bar{y}$ and correlation coefficient between x and y. (4½)

(c) Fit a second degree parabola to the following data :

x :	0	1	2	3	4
y :	1	5	10	22	38

(4½)

P.T.O.

SECTION VI

6. (a) Before an increase in excise duty on tea, 400 people out of a sample of 500 persons were found to be tea drinker. After an increase in duty, 400 people were tea drinkers in a sample of 600 people using standard error of proportion, state whether there is a significant decreases in the consumption of tea. (5)

(b) A drug was administered to 10 patients and the increments in their blood pressure (B.P.) were recorded to be

6, 3, –2, 4, –3, 4, 6, 0, 0, 2

Is it reasonable to believe that the drug has no effect on change of B.P.

(Given : $t_{0.05}$ for 9 d.f. = 2.26) (5)

(c) Five coins are tossed 3200 times and the following results are obtained :

No. of heads :	0	1	2	3	4	5
Frequency :	80	570	1100	900	500	50

Test the hypothesis that the coins are biased.

(Given : $\chi^2_{0.05}$ for 5 d.f. = 11.07) (5)