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5013

Your Roll No.....

B.Sc. (G) / III

B

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 question.
Symbols have their usual meanings.*

- (a) Find the mean deviation from the mean and standard deviation of $a, a + d, a + 2d, \dots, a + 2nd$. (4½)

(b) Show that for a discrete distribution $\beta_2 > \beta_1$. (4½)

(c) The first four moments of a distribution about the value 4 are $-1.5, 17, -30, 108$. Calculate β_1 and β_2 . (4½)
- (a) 5% of the people have high blood pressure. Of the people with high blood pressure, 75% drink alcohol; whereas only 50% of people without high blood pressure drink alcohol. What percent of drinkers have high blood pressure? (4½)

P.T.O.

(b) Three groups of children contain respectively 3 girls and 1 boy; 2 girls and 2 boys; 1 girl and 3 boys. One child is selected at random from each group. Find the probability that the three selected consist of 1 girl and 2 boys. (4½)

(c) If X and Y are any two discrete random variables, show that

$$E(X + Y) = E(X) + E(Y)$$

where $E(X)$ is the expected value of X . (4½)

3. (a) For a Binomial distribution, show that

$$\mu_{r+1} = pq \left[nr\mu_{r-1} + \frac{d\mu_r}{dp} \right] \quad (4\frac{1}{2})$$

(b) A car-hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused.

(Use $e^{-1.5} = 0.2231$) (4½)

(c) Determine the mode of the Poisson distribution. (4½)

4. (a) Show that for the normal distribution, the mean deviation about mean is $\frac{4}{5}\sigma$ (approx.). (4½)

(b) Show that for the probability distribution

$$dF = y_0 e^{-|x|} dx, \quad -\infty < x < \infty$$

mean = 0, variance = 2 and

mean deviation about mean = 1 (4½)

(c) Assume a normal distribution with $\mu = 80$ and $\sigma = 15$ and $N = 1000$. How many observations may be expected to lie between 65 and 110? Also find the value of the variate beyond which 10% of the observations would lie. (4½)

5. (a) If x and y are two correlated variables with the same standard deviation and correlation coefficient r , show that the correlation coefficient between x

and $x + y$ is $\sqrt{\frac{1+r}{2}}$. (4½)

(b) If the lines of regression of y on x and x on y are respectively $y = Kx + 4$ and $x = 4y + 5$. Show that

$$0 \leq K \leq \frac{1}{4}. \quad (4½)$$

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

$x :$	0	1	2	3	4	
$y :$	1	1.8	1.3	2.5	6.3	(4½)

6. (a) In a year there are 956 births in town A of which 52.5% were males, while in town A and B combined, the proportion in a total of 1406 births was 0.496. Is there any significant difference in the proportion of male births in the two towns. (5)

(b) Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches square and 91 inches square respectively. Can they be regarded as drawn from the two normal populations with same variance ?

(Given : $F_{0.05}$ for 8 and 7 d.f. = 3.73) (5)

(c) May the following set of observations be regarded as those of a random sample from a Poisson distribution, ($e^{-0.5} = 0.61$) ?

Deaths x	:	0	1	2	3	4	Total
Frequency f	:	122	60	15	2	1	200

(Given : $\chi_{0.05}^2$ for 1 d.f. = 3.84) (5)