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Your Roll No. .....

513

Subsidiary for B.Sc. (Hons.)/II A
MATHEMATICS – Paper IV (ii)
(Statistics)

Time : 3 Hours **Maximum Marks : 75**

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

Attempt any **six** questions.
All questions carry equal marks.

1. (a) Show that the root mean square deviation is least when deviations are measured from the mean. 6

   (b) Show that for a discrete distribution $\beta_2 \geq 1$. $6\frac{1}{2}$

2. (a) Show that for any two events A and B, $P(A + B) = P(A) + P(B) - P(AB)$. 6

   (b) A problem in statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively, what is the probability that the problem will be solved ? $6\frac{1}{2}$

3. (a) Find the mathematical expectation of the sum of numbers when n dice are thrown. 6

(b) Six dice are thrown 729 times. How many times do you expect at least three dice to show a 5 or 6 ? $6\frac{1}{2}$

4. (a) Show that in a Poisson distribution with unit mean, mean deviation about mean is $\frac{2}{e}$ times the standard deviation. 6

(b) If x_1 and x_2 are two independent Poisson variates with parameters m_1 and m_2, show that $x_1 + x_2$ is also a Poisson variate with parameter $m_1 + m_2$. What can you say about $x_1 - x_2$? $6\frac{1}{2}$

5. (a) If X and Y are independent normal variates with means 6, 7 and variances 9, 16 respectively, determine λ such that : 6

$P[2X + Y \leq \lambda] = P[4x - 3y \geq 4\lambda]$

(b) Show for a normal distribution with variance σ^2,

$\mu_{2n} = 1.3.5 \ldots\ldots (2n - 1)\, \sigma^{2n}$ $6\frac{1}{2}$

6. (a) Two variates X and Y have zero means, the same variance σ^2 and zero correlation. Show that

$u = X \cos \alpha + Y \sin \alpha$, $V = X \sin \alpha - Y \cos \alpha$

have the same variance σ^2 and zero correlation. $6\frac{1}{2}$

(b) Fit a straight line to the following data : 6

x :	1	2	3	4	5
y :	5	7	9	10	11

7. (a) If α is the acute angle between two regression lines, show that

$$\tan \alpha = \frac{1 - r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$$

interpret the cases when $r = 0$, $r = \pm 1$. $6\frac{1}{2}$

(b) 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 ? 6

8. (a) A drug was given to 10 patients and the increase in their BP was 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 the change of BP ?

(Given $t_{\underset{(9\ deg)}{.05}} = 2.26$) 6

(b) Calculate χ^2 for the following contingency table :

a	b
c	d

(Under the hypothesis of independence) $6\frac{1}{2}$

9. Write short notes on the following : $4 + 4 + 4\frac{1}{2}$

(i) Cumulant Generating function and its properties.

(ii) Normal Distribution.

(iii) Mathematical Expectation.
