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Roll No. | | | | | | | | | | |

S. No. of Question Paper : **7511**

Unique Paper Code : **62357503**

Name of the Paper : **DSE–Statistics**

Name of the Course : **B.A. (Prog.)**

Semester : **V**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt any *two* parts from each question.

All questions are compulsory and carry equal marks.

1. (*a*) A person draws two balls from a bag containing 3 white and 4 red balls. If he is to receive Rs. 10 for every white ball which he draws and Rs. 20 for each red ball. Find his expectation. 6.5

(*b*) In a lot of 50 light bulbs, there are 2 bad bulbs. An inspector examines five bulbs, which are selected at random and without replacement : 6.5

(*i*) Find the probability of at least one defective bulb among the five.

(*ii*) How many bulbs should be examined so that probability of finding at least one bad bulb exceeds 1/2 ?

(*c*) The contents of urns I, II and III are as follows :

1 white, 2 red and 3 black balls

2 white, 3 red and 1 black ball, and

3 white, 1 red and 2 black balls

One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urns I, II or III ? 6.5

P.T.O.

2. (a) Suppose that X is a random variable with E(X) = 10 and V(X) = 25. Find the positive number a and b such that $Y = aX - b$, has mean zero and variance 1.

(b) A variate X has the probability distribution :

X	–3	6	9
P(x)	1/6	1/2	1/3

Find E(X) and $E(X^2)$ and using the law of expectation, evaluate $E[(3X - 4)^2]$.

(c) Find the cdf of the random variable X whose pdf is given by :

$$f(x) = \frac{1}{8} + \frac{3}{8}x, \forall\, 0 \le x \le 2$$

Hence find $P(1 \le X \le 1.5)$ and $P(X > 1)$.

3. (a) If X is a discrete random variable with mgf $M_X(t)$ and let $Y = aX + b$. Then prove that $M_Y(t) = e^{bt}M_X(at)$.

(b) If a random variable X has Poisson distribution with mean unity, then show that :

$$E(|X - 1|) = \frac{2}{e}\sigma_X.$$

(c) A car hire firm has two cars which it hires out day to day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which :

(i) Neither car used

(ii) Some demand is refused. ($e^{-1.5} = 0.2231$).

(*a*) For the following density function $f(x) = cx^2(1 - x)$, $0 < x < 1$, $f(x) = 0$, otherwise. Find : 6

(*i*) The value of constant c

(*ii*) The mean.

(*b*) If X is normal variate with mean 10 and standard deviation 4, determine the probability $P(X \geq 7)$. 6

$$[\text{Given}: \frac{1}{\sqrt{2\pi}} \int_0^{0.75} e^{-\frac{1}{2}z^2} dz = 0.2734]$$

(*c*) If X has exponential distribution with parameter λ, then prove that : 6

$$E(X) = \frac{1}{\lambda}, V(X) = \frac{1}{\lambda^2}.$$

(*a*) A random sample of 10 boys had the following I.Q.'s

70, 120, 110, 101, 88, 83, 95, 98, 107, 100.

Do these data support the assumption of a population mean I.Q. of 100 ? $(t_{0.05}(9) = 2.262)$. 6.5

(*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 ? 6.5

$$(F_{0.05}(8, 7) = 3.73)$$

(*c*) A simple sample of 1000 members is found to have a mean of 3.42 cm. Could it be reasonably regarded as a simple sample from a large population whose mean is 3.30 cm and standard deviation 2.6 cm ? 6.5

6. (a) A random sample of 16 cm men from country A had a mean height of 68 inches and a sum of squares from the sample mean is 132. A random sample of 25 men from country B had the corresponding values 66.5 inches and 165. Can the samples be regarded as drawn from the normal population ? [F value for (15, 24) degrees of freedom at 5% level of significance is 2.11].

(b) Find the student's t for the following variable values in a sample of ten :

$-6, -4, -1, -1, 0, 1, 1, 3, 4, 5$, taking the mean of the universe to be zero.

(c) A die is tossed 120 times and each outcome is regarded as under :

Faces	1	2	3	4	5	6
Frequency	20	22	17	18	19	22

Is the distribution of outcomes uniform ? $\left(\chi^2_{0.05}(5) = 11.07\right)$