

(i) Printed Pages : 2

Roll No.

(ii) Questions : 8

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B.A./B.Sc. (General) 5th Semester

1128

MATHEMATICS

Paper-III : Probability Theory

Time Allowed : Three Hours]

[Maximum Marks : 30

Note :- Attempt FIVE questions in all, selecting at least two questions from each section. All questions carry equal marks.

SECTION—A

1. (a) State and prove Boole's inequality. 3
(b) A deck of playing cards is found to contain 51 cards. If first thirteen examined cards are all red. What is probability that missing card is black ? 3
2. (a) Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male by assuming that number of males and females are equal ? 3
(b) If expected value of random variable X exists then expected value of X^2 also exists. Comment. 3
3. (a) For what value of a, the quantity $E(x-a)^2$ is minimum. 3
(b) Find the mode of binomial distribution. 3

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[Turn over

4. (a) Find the moment generating function of Geometric distribution. 3
 (b) If random variable X has Poisson distribution such that $P(X=1) = P(X=2)$ then find $P(X=4)$. 3

SECTION—B

5. (a) If a random variable X has exponential distribution with mean 2 then find $P(X < 1 | X < 2)$. 3
 (b) If X is random variable with a continuous distribution function $F(x)$ then $F(x)$ has a uniform distribution on $[0, 1]$. 3
6. (a) Prove that mean deviation from mean for normal distribution is $\frac{4}{5}\sigma$ (approximately); σ is S.D. 3
 (b) If X is $N(\mu, \sigma^2)$ then find the distribution of $aX + b$. 3
7. (a) Let X and Y be two random variables having joint density function :

$$f(x, y) = \begin{cases} c(6 - x - y) & 0 < x < 2, 2 < y < 4 \\ 0 & \text{otherwise} \end{cases}$$

Find $P(X + Y < 4)$. 3

- (b) Let X has the p.d.f. $f(x) = \begin{cases} \frac{x^2}{9} & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$. Find p.d.f. of

$$Y = X^3. \quad 3$$

8. (a) Let X, Y be independent random variables each having

$$\text{p.d.f. } f(t) = \begin{cases} e^{-t} & t > 0 \\ 0 & \text{otherwise} \end{cases} \text{ Show that } Z = \frac{X}{Y} \text{ has an}$$

F-distribution. 3

- (b) Show that coefficient of correlation is independent of change of scale and origin. 3

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