(i) **Printed Pages : 2** **Roll No. ....**

(ii) **Questions : 8** **Sub. Code : 0 4 4 5**

Exam. Code : 0 0 0 5

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

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 $Y = X^3$. 3

8. (a) Let X, Y be independent random variables each having p.d.f. $f(t) = \begin{cases} e^{-t} & t>0 \\ 0 & \text{otherwise} \end{cases}$. Show that $Z = \frac{X}{Y}$ has an F-distribution. 3

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