TOTAL PAGES : 2

23MCU313

PSG COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2023

(Third Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATION**

ADVANCED MATHEMATICAL STATISTICS-I

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (5 x 1 = 5)

1)If P(A) = 0.4 , P(B) = 0.5 and P(A∩B) = 0.2 then P(B/A) is

(i) 1/2 (ii) 1/3
(iii) 4/5 (iv) 2/5

2) $\sum_{i=1}^{n} P(x_i)$ is equal to

(i) 0 (ii) 1
(iii) -1 (iv) ∞

3) Var (x + 8) is

(i) Var(8) (ii) Var(X)
(iii) 8Var(X) (iv) 0

4) If X is a random variable and f(x) be the probability function, then subject to the convergence, the function $\sum e^{tx} f(x)$ is known as

(i) Moment generating function (ii) Probability generating function
(iii) Probability distribution function (iv) Characteristic function

5) Poisson distribution correspondents to

(i) rare events (ii) certain event
(iii) impossible event (iv) almost sure event

SECTION - B (15 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6) a) If $B \subset A$,then prove that

i) $P\left(A \cap \overline{B}\right) = P(A) - P(B)$

ii) $P(B) \leq P(A)$

OR

b) The odds that person X speaks the truth are 3:2 and the odds that person Y speaks the truth are 5:3. In what percentage of cases are they likely to contradict each other on an identical point.

7) a) Write the properties of Distribution Function.

OR

b) Let f(x) = c(1-x) X^2 , 0 < x < 1 be the probability density function of a random variable X. Find the constant c.

8) a) State and prove Addition theorem of Expectation.

OR

b) Let X be a random variable with the following probability distribution:

x	-3	6	9
P(X=x)	1/6	1/2	1/3

Find E(X), $E(X^2)$ and using the laws of expectation, evaluate $E(2X+1)^2$.

9) a) List out the properties of MGF.

OR

Cont...

9) b) Find the characteristic function of the distribution.

$$f(x)=\begin{cases}\dfrac{1}{b-a}, & a<x<b\\ 0 & otherwise\end{cases}$$

10 a) Write any five properties of normal distribution.

OR

b) If x is a Poisson variate such that P(X=1)=3/10 and P(X=2)=1/5 Find P(X=0) and P(X=3)

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11) a) State and prove Baye's theorem

OR

b) A and B throw alternately with a pair of dice. A wins if he throws a sum of 6 before B throws 7, and B wins if he throws 7 before a throws 6. If A begins, find his chance of winning.

12 a) The diameter, say X, of an electric cable is assumed to be a continuous random variable with p.d.f : $f(x)=6x(1-x), 0 \le x \le 1$

i) Check that the above is p.d.f

ii) Obtain an expression for the c.d.f of X.

iii) Compute $P\left(X \le \frac{1}{2} | \frac{1}{3} \le X \le \frac{2}{3}\right)$

iv) Determine the number k such that $P(X<k)=P(X>k)$

OR

b) The joint probability density function of a two-dimensional random variable X,Y is given by

$$f(x,y)=\begin{cases}2; & 0<x<1, 0<y<x;\\ 0, & elsewhere\end{cases}$$

i) Find the marginal density functions of x and y

ii) Find the conditional density function of y given X=x and conditional density function of X given Y=y

13) a) i) State and prove multiplication theorem on expectation.

ii) Explain conditional expectation and conditional variance.

OR

b) A continuous random variable X has a pdf given by

$$f(x)=\begin{cases}kxe^{-\lambda x}, & x\ge 0, \lambda \ge 0\\ 0 & otherwise\end{cases}$$

Determine the constant k, Obtain the mean and Variance of X.

14) a) State and prove the properties of Characteristics function.

OR

b) Find MGF of Normal distribution.

15) a) Find the mean and variance of binomial distribution.

OR

b) In a test of 2000 electric bulbs it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 60 hours. Estimate the number of bulbs likely to burn for

i) more than 2150 hours

ii)less than 1950 hours

iii)More than 1920 hours but less than 2160 hours

Z-Z-Z END