Total No. of Printed Pages: 02

SUBJECT CODE NO: - Y-2122
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-VI)
Examination March / April - 2023
Mathematics
Mathematical Statistics-II - MAT -603

[Time: 1:30 Hours] **[Max. Marks: 50]**

Please check whether you have got the right question paper.

N. B
1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q1 A) Attempt any one: 08

a) Prove that:
The mathematical expectation of the product of a number of independent random variables is equal to the product of their expectations.

b) If $x_1, x_2 \ldots \ldots \ldots \ldots . x_n$ be n random variables, then show that

$$V\left(\sum_{i=1}^{n} a_i \; x_i\right) = \sum_{i=1}^{n} a_i^2 \, V\,(x_i) + 2\sum_{i=1}^{n}\;\sum_{j=1}^{n} a_i\, a_j\, cov(x_i, x_j)$$

B) Attempt any one: 07

c) If m things are distributed among ‘a’ men and ‘b’ women, show that the probability that the number of things received by men is odd is given by

$$\frac{1}{2}\left[\frac{(b+a)^m-(b-a)^m}{(b+a)^m}\right]$$

d) If 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) and E (x^2) and using the laws of expectation evaluate $E(2x+1)^2$

Q2 A) Attempt any one: 08

a) Find the mode of the normal distribution.

b) In case of uniform distribution , Prove that : $\mu_2 = \frac{1}{12}(b-a)^2$

B) Attempt any one: 07

c) If $x \sim B\,(n, p)$, show that:

$$E\left(\frac{x}{n}-p\right)^2=\frac{pq}{n}\ ;Cov\ \left(\frac{x}{n},\frac{n-x}{n}\right)=\frac{-pq}{n}$$

d) If x and y are independent Poisson variates with means $\lambda_1 and\ \lambda_2$ respectively Find i) x + y = k ii) x = y

Q3 A) Attempt any one 05

a) Prove that correlation coefficient is the geometric mean between the regression coefficients.

b) Find the mean and variance of the Poisson distribution

B) Attempt any one: 05

c) If x and y are independent poisson variates having mean 1 and 3 respectively. Find the variance of 3x + y.

d) If the independent random variables x ,y are binomially distributed , respectively n = 3 , $P=\frac{1}{3}$ and n = 5, $P=\frac{1}{3}$, write down the probability that $x+y\ \geq 1$

Q4 Choose the correct alternatives: 10

1) If x is a random variable , also a and b are constants , then $V(ax+b)=\cdots$

a) $a^2\,V(x)$ b) $av\ (x)+b$ c) $V\ (a^2x)+b$ d) None of these

2) If x and y are independent the cov (x,y) = ………..

a) 1 b) 0 c) -1 d) 2

3) When the correlation coefficient $r=\pm1$ then the two regression lines ……

a) Are perpendicular to each other
b) Coincide
c) Are parallel to each other
d) Do not exist

4) If $x\sim p\ (\lambda)$ then mean of poisson distribution is …………

a) λ^2 b) $1/_{\lambda}$ c) λ d) $1/_{\sqrt{\lambda}}$

5) The mean of the binomial distribution is ………..

a) Np b) npq c) $npq\ (q-p)$ d) $npq\ \{1+3(n-2)\ pq\}$