BCA 4th Semester Examination, 2024(May)
Paper:BCA-408(New)
Probability and Statistics

Full Marks: 75
Time: 3 hours

1.Answer **all** questions. Each question carries 1 mark  (1x10=10)

i) Define the term discrete random variable.

ii) Why is the value of $\mu_0' = 1$?

iii) What is the probability of getting 5 heads and 6 tails in 11 flips of a balanced coin?

iv) What is uniform distribution of a discrete random variable?

v) Why is geometric distribution a special case of negative binomial distribution?

vi) Define joint probability density function.

vii) Define the term correlation.

viii) What is  the value of E(aX),where a is a constant and E(X)=10?

ix) Why is $\mu_{0,1}' \neq E(X)$ ?

x) How many triangles can you form using **n** collinear points?

2. Answer any **FIVE** out of **EIGHT** questions. Each question carries 2 marks.                                    (2x5=10)

i) Determine c so that the function f(p)=c(0.25)$^p$ for p=1,2,3,...can serve as the probability distribution function .

ii) Can you find out $\mu_r'$ of a random variable using moment generating function of X ? Explain.

(1)

iii) Write the formulae for mean and variance of Poison distribution.

iv) Explain Bernoulli distribution.

v) Write any two properties of joint probability density function.

vi) Explain conditional distribution of two random variables.

vii) How do you find E(X) and E(Y) from $\mu'_{r,s}$ ?

viii) Explain correlation coefficient.

3. Answer any **FIVE** out of **EIGHT** questions. Each question carries 5 marks.     (5x5=25)

i) If X has the probability density function
$$f(x) = \begin{cases} xe^x & for\ x > 0 \\ 0 & elsewhere \end{cases}$$
Find the value of (i) $P(0.5 \leq X \leq 1)$.

ii) Certain coded measurements of the pitch diameter of threads of a fitting have the probability density
$$f(x) = \begin{cases} \dfrac{9xy^0}{1-x^3} & for\ 0 < x < 1 \\ 0 & elsewhere \end{cases}$$
where y is a real no

Find the expected value of this random variable

iii) Derive the formula for moment generating function of uniform distribution of a discrete random variable.

iv) State and prove Chebyshev's theorem.

(2)

v) If the probability is $\log_e e^{0.7}$ that a child exposed to a certain contagious disease will catch it, What is the the probability that the 12$^{th}$ child exposed to the disease will be the fifth child to catch it?

vi) Derive the formula of relationship between the covariance, $\mu'_{0,1}, \mu'_{1,0}$ and $\mu'_{1,1}$ of two random variables X and Y.

vii) Derive the formulae for the mean and variance of Gamma distribution.

viii) Determine the value of a for which the function given by

$$f(x,y)=a(x + y)^{-2} \quad \text{for } x=1,2,3 \text{ and } y=1,2,3$$

can serve as joint probability distribution function.

4. Answer any **THREE** out of **FIVE** questions. Each question carries 10 marks. (10x3=30)

i) Two balls are selected at random and removed in succession from a box containing 8 blue and 4 grey balls. Find the distribution function of the random variable W , where W is the number of grey balls selected.

ii) If the joint probability density of X and Y is given by

$$f(x,y) = \begin{cases} \dfrac{7(1+x+y)}{3(x+1)^3(1+y)^5} & \text{for } 0 \leq x \text{ and } 0 \leq y \\ 0 & elsewhere \end{cases}$$

Find the marginal density of X and Y.

(3)

iii) Derive the formulae for the mean and the variance of the binomial distribution of a discrete random variable.

iv) If A be the number of tails in four tosses of an unbiased coin, find the expected value of A.

v) Calculate the correlation coefficient by Karl Pearson's method for the following weights(in kg) of mothers(X) and their daughters(Y):

| X | 52 | 65 | 76 | 84 | 73 | 66 | 70 | 72 |
|---|----|----|----|----|----|----|----|----|
| Y | 70 | 71 | 66 | 53 | 70 | 65 | 76 | 56 |

(4)