



DCST201

640274

Reg. No.

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II Semester B.Sc. Degree Examination, September - 2023

STATISTICS

Probability and Distributions

Paper : II

(NEP Scheme (F+R))



Time : 2½ Hours

Maximum Marks : 60

Instructions to Candidates:

1. Answer any eight sub - divisions from Section A and any three questions from Section -B.
2. Scientific calculators are allowed.

SECTION -A

1. Answer any **Eight** sub-divisions from the following.

(8×3=24)

- a. Define :
 - i. Sample space.
 - ii. Simple and composite events.
 - iii. Sure event.with an example each.
- b. State axioms of probability and prove that $P(A^c) = 1 - P(A)$.
- c. If A and B are independent events then prove that A and B^c are also independent.
- d. If X is a random variable and 'a' and 'b' are any two constants, then prove that
 - i. $V(a) = 0$,
 - ii. $V(aX) = a^2 V(X)$.
 - iii. $V(aX+b) = a^2 V(X)$.
- e. Let X be a discrete random variable with probability mass function (p.m.f)

$$P(X = x) = \frac{x}{21} ; x = 1, 2, 3, 4, 5, 6$$

Find mean and variance.

[P.T.O.]



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- f. Define r^{th} raw moments of a random variable X and hence find the same for the following distribution $f(x) = 2x; 0 < x < 1$.
- g. Define moment generating function (m.g.f) of a random variable and state its properties.
- h. Obtain mean and variance of Bernoulli distribution.
- i. Define gamma distribution and find its mean.
- j. Mention the drawbacks of R-software.

SECTION - B

Answer any **Three** questions from the following.

(3×12=36)

- 2.
 - a. State and prove addition theorem of probability.
 - b. Define pair - wise and mutual independent of 'n' events. Also show that there are $2^n - n - 1$ conditions required to be satisfied for mutual independence of 'n' events.
 - c. State Bayes' theorem. (4+6+2)
- 3.
 - a. Define distribution function and state its properties.
 - b. For the following function $f(x) = \begin{cases} K(x^2)(1-x); & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$.
 - i. Find the constant K .
 - ii. Also find mean and variance.
 - c. Obtain m.g.f of the function $f(x) = P(1-P)^x; x = 0, 1, 2, \dots$ where $1-p = q$. (3+6+3)
- 4.
 - a. Obtain m.g.f. of Binomial distribution.
 - b. Define poisson distribution and find its mean and variance.
 - c. State and prove lack of memory property of geometric distribution. (3+5+4)
- 5.
 - a. Define beta distribution of second kind and find its mean.
 - b. Obtain mean and variance of exponential distribution.
 - c. Define normal distribution and mention its chief characteristics. (3+4+5)
- 6.
 - a. Explain the benefits of R-software.
 - b. Explain assignment operators used in R-software.
 - c. Mention the arithmetic operators used in R-software. (4+4+4)
