DCST201

Reg. No. | | | | | | | | |

II Semester B.Sc. Degree Examination July/August-2024

STATISTICS

Probability and Distributions

(Scheme : NEP)

Paper : II

Time : 2½ Hours **Maximum Marks : 60**

Instructions to Candidates :

1. **Answer any Eight sub-divisions from Section A and Three questions form Sec tion B.**
2. **Scientific Calculators are allowed.**

SECTION - A

I. Answer any Eight sub-divisions from the following : **(8×3=24)**

a) Define
   i) Simple and composite event
   ii) Equally likely events
   iii) Exhaustive events

b) If A and B are independent events, show that A and B are also independent.

c) Define conditional probability and establish multiple theorem of probability/

d) Define random variable and its mathematical expectation and variance.

e) Let X be a random variable with p.m.f $p(X=x)=Kx$; $x = 1,2,3,4,5$. Find the value of K and its mean.

f) If X is a random variable and 'a' & 'b' are any two constants, then prove that
   i) $E(ax) = aE(x)$
   ii) $V(ax) = a^2V(x)$
   iii) $V(ax+b) = a^2V(x)$

g) The p.d.f of a random variable x is $f(x) = 2x$; $0 < x < 1$ find E(x) and V(x).

h) Given m.g.f $Mx(t) = P(1-qe^t)^{-1}$, find E(x).

i) Define standard normal variate and write its p.d.f.

j) Explain the benefits of R-software.

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SECTION - B

II. Answer any three questions from the following. (3×12=36)

2. a) State the axioms of probability and prove that $P(A' \cap B) = P(B) - P(A \cap B)$

   b) If A,B and C are pair wise independent events and A is independent of $(B \cup C)$, then prove that A, B and C are mutually independent.

   c) State and prove Bayes theorem.

(4+3+5)

3. a) Define r^{th} raw moments of a random variable X.

   b) For the following function f(x) = 6x(1-x) ; 0<x<1.

      i) Check whether f(x) is a p.d.f. If so,

      ii) Find the distribution function of X

      iii) Find its mean and variance.

   c) Define moment generating function (m.g.f) of X and obtain the same for the give p.d.f $f(x)=\begin{cases} e^{-x} & ; x>0 \\ 0 & ; \textit{otherwise} \end{cases}$

(2+6+4)

4. a) Obtain m.g.f. of Binomial distribution and hence find its mean.

   b) Obtain the recurrance formula for moments of a Poisson distribution and find its variance.

   c) Define Geometric distribution and find its mathematical expectation.

(4+5+3)

5. a) State and prove lack of memory property of exponential distribution.

   b) i) Obtain the m.g.f of a normal distribution

      ii) Prove that linear combination of independent normal variates is also a normal variate.

   c) Obtain mean of Gamma distribution.

(3+6+3)

6. a) Mention arithmetic operators used in R-software.

   b) What are built - in functions? Discuss this with reference to R - software.

   c) Mention the graphical functions used for standard plots in R-software.

(4+4+4)