Progressive Education Society's

Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16 (Autonomous)

End Semester Examination: MAR / APR 2025

***Total No. of Questions**: 3/ 18* ***Total No. of Pages**: 2*

FIRST YEAR (General)

24STA12101: Discrete Probability and Probability Distributions

(Semester II)

Program: F. Y. B. Sc.(General) **Credits:** 2
Program Specific: B. Sc.(General) **Time:** 2 Hours
Course Type: DSC **Max. Marks:** 30
Paper: Discrete Probability and Probability Distributions **SET: A**

Instructions to the candidate:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw a well labelled diagram wherever necessary.*

Q1) Attempt **ANY SIX** of the following: **[6 X 2 = 12]**

a) Define and explain sample space.

b) Define Bernoulli random variable, explain with example.

c) What is classical approach of probability?

d) Differentiate between joint and marginal probability distribution.

e) Define raw and central moments of random variable.

f) Represent the event using Venn diagram 1) Only A 2) Both A and B.

g) Explain the term "partition of sample space".

h) Define "Simple event", explain with example.

Q2) Attempt **ANY THREE** of the following: **[3 X 4 = 12]**

a) Define independent events. For certain random experiment A and B are events defined on sample space Ω, P (A) =0**.**5, P (B) = 0**.**6 and P ($A \cap$ B) =0**.**3 Check whether A and B are independent. Hence or otherwise find P (AUB).

b) What is skewness of the distribution? For certain random variable the first three moments are 3, 8, and 30 find the third order central moment and hence comment on skewness.

c) State the mean and variance of Poisson random variable X. For certain Poisson distribution E(X) = 5, find P(X< 3).

d) For certain Geometric distribution E(X) =1 find Var(X). Also find P($X \leq 2$).

e) For certain bivariate distribution E(X) =12, E(Y) =10, Var(X) =225, Var(Y) =36 and cov(X, Y)= 30.6. Calculate

i. E(X+Y)

ii. Var(X+Y).

f) State the relation between Joint, Marginal and conditional distribution.

If P(x,y)=(x+y)/21; x=1,2,3 and y=1,2.

i. Marginal distribution of X.

ii. Conditional distributional of Y given X=2.

Q3) Attempt **ANY TWO** of the following: **[2 X 3 = 06]**

a) If certain random variable follows probability law

x	0	1	2	3	4
P(X=x)	0.2	0.2	0.2	0.2	0.2

Find

i. E(2X+3)

ii. Var(2X)

b) State moment generating function of negative binomial distribution. Hence derive expected value (1^{st} order raw moment) of NB (10, 0.25) distribution.

c) Define Bernoulli distribution. Give the real life situation where it is applicable. If X follows Bernoulli distribution show that all raw moments are equal.

d) For the following joint probability distribution obtain E(X|Y=1), Var (X|Y=1)

X / Y	-1	0	1
1	k	2k	k
2	2k	3k	2k
3	k	k	k

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