Seat No-.........

Progressive Education Society's

Modern College of Arts, Science and Commerce *(Autonomous)*

Shivajinagar, Pune -5

[Total no. of questions:4] [Total number of pages:2]

First Year B.Sc. (Mar-2020)

End Semester Backlog Examination, (2019 Pattern) Semester – I

Course Code: 19ScStaU102 **Course Name:** Discrete Probability & Probability Distribution-I

Date: 17.03.2020 **Time: 10.00 a.m.-12.00 p.m.**

[Time: 2 Hours] [Max Marks: 60]

Instructions:

1. All questions are compulsory.
2. All questions carry equal marks.
3. Use of scientific non-programmable calculators and statistical tables are allowed.
4. Symbols and abbreviations have usual meaning.

Q.1. a. Choose the correct alternative for each of the following: **[1 each]**

i. The classical approach to probability assumes that all possible outcomes of an experiment are

a) Independent b) equally likely

c) dependent d) Mutually exclusive

ii. Given that $P(A \cap E) = 0.16, P(A' \cap E) = 0.32\ , P(A \cap E') = 0.11$ and $P(A' \cap E') = 0.41$. What is P(A) ?

a) 0.25 b)0.29 c)0.27 d)0.34

iii. If X follows discrete uniform distribution on 0,1, 2.........,n and the mean of the distribution is 6. Hence the value of n is

a) 6 b) 18 c) 36 d)11

b. State whether each of the statements given below is True or False: **[1 each]**

i. If $\gamma_2 < 0$,the distribution is mesokurtic.

ii. A Bernoulli trial is a random experiment which has only two outcomes.

c. Attempt any <u>two</u> of the following. **(2x5=10)**

i. Define cumulative distribution function of a discrete random variable and state its any three properties.

ii. Give the classical definition of probability. States its limitations.

iii. If X and Y denotes the points on uppermost face when two six face unbiased dice are thrown, find P(X=Y) and P(X+Y is an even number)

Q.2 Attempt any <u>three</u> of the following. **(3x5=15)**

a. Define and give illustration each of the following :

i. Mutually exclusive events.

ii. Exhaustive events.

b. A batch of 10 iron rods consists of 3 oversized rods, 2 undersized and 5 rods of desired length. If 2 rods are drawn at without replacement, what is the probability that

i. both are of desired length

ii. both are oversized

c. A discrete random variable X has the following p. m. f ;

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

$$= 0 \quad \text{O.W.}$$

Find E(2X) and E(X^2).

d. Let X be a discrete random variable with r^{th} central moment $\mu_r(x)$. Let Y = $\frac{X-a}{h}$, with r^{th} central moment $\mu_r(y)$ then prove that $\mu_r(x) = h^r \mu_r(y)$

Q.3. Attempt any <u>three</u> of the following. (3x5=15)

a. Given A and B are two independent events defined on Ω, Prove that A′ and B′ are independent.

b. A random variable X has the following probability distribution :

$$P(x) = k\left(\frac{2}{3}\right)^x \quad , x = 1, 2, \dots\dots \text{; where k is constant}$$

find

i. k

ii. P(X =1).

c. A card is drawn at random from a well shuffled pack of 52 playing cards.
Let A,B and C be the three events as below :
A : The card is a diamond.
B : The card is a heart.
C : The card is a King
Find P(AU $B \cup C$)

d. Define Cumulant generating function (c. g. f.) of a discrete random variable. Explain how the cumulants are obtained using c. g. f.

e. An electronic assembly contains two subsystems A and B . From previous testing procedures, the following probabilities are assumed to be known P(A fails)=0.20,
P(A fails)=0.20 , P(A and B fails)=0.15 and P(B alone fails)=0.15. Evaluate
i. P(A alone fails)
ii. P(A fails|B has failed)

Q.4. Attempt any <u>two</u> of the following. (3x5=15)

a. State and prove Bayes' theorem.

b. The probability distribution of a discrete r. v. X is given below:

X	0	1	2	3
P[X=x]	0.1	0.3	0.4	0.2

Find γ_1.Also comment on the nature of the distribution.

c. From a lot of 10 items containing 3 defective a sample of 4 items is drawn at random. Let the random variable X denote the number of defective items in the sample. Find the probability mass function. Also compute average number of defective

d. Show that all raw moments of Bernoulli trials are equal to `p'

e. The probability distribution of a discrete random variable X is as follows:

X	0	1	2
P(X=x)	0.25	0.50	0.25

Find i) P(X> 0)
ii)P(X>1|X>0)
iii)E(X)

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