BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-I : WINTER- 2022
SUBJECT : STATISTICS : DISCRETE PROBABILITY & PROBABILITY DISTRIBUTIONS-I

Day : Wednesday | Time : 10:00 AM-01:00 PM

Date : 21-12-2022 | **W-18311-2022** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of statistical tables and **CALCULATOR** is allowed.

Q.1 Attempt **ANY TWO** of the following: **[12]**

a) If A and B be two events define on Ω, then prove that:

i) $P(A) \leq P(B)$ when $A \subset B$.

ii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

b) Define cumulative distribution function and state its properties.

c) A factory employees both male and female workers. The probability that a worker chosen at random is male is 0.65, that the worker is married is 0.7 and that the worker is a married male is 0.47. Find the probability that a worker chosen at random is:

i) a married female

ii) a male or married or both

iii) a unmarried male

Q.2 Attempt **ANY TWO** of the following: **[12]**

a) Define mutual independent and pairwise independence with illustrations.

b) The following is a p.m.f. of r.v. X.

X	-3	-1	0	1	2	3	5	8
P(x)	0.1	0.2	0.15	0.2	0.1	0.15	0.05	0.05

Find: **i)** $P(0 < X < 2)$ **ii)** cumulative distribution function of X.

iii) P(X is odd)

c) The p.m.f. of a discrete r.v. X is $p(x) = \frac{1}{15}$, $x = 1, 2, \ldots\ldots, 15$. Find:

i) E(X) **ii)** Var (X) **iii)** Var (3X + 5) **iv)** E(5 – 4X)

Q.3 Attempt **ANY TWO** of the following: **[12]**

a) Define binomial distribution with parameters n and p. Find its mean and variance.

b) Define m.g.f. of discrete r.v. X. State its properties

P.T.O.

c) A r.v. X has the following probability distribution

X	0	1	2	3
P(x)	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

Find the probability distribution of:

i) $W = X - 1$ **ii)** $Y = \frac{3X+2}{2}$ **iii)** $Z = X^2 + 2$.

Q.4 Attempt **ANY THREE** of the following: **[12]**

a) Explain the following terms with illustrations:
i) Exhaustive events
ii) Complement of an event

b) Define probability model. State the axioms of probability.

c) Check whether the following functions can be looked upon p.m.f. of X.

i) $p(x) = \frac{x+1}{10}$, $x = 0, 1, 2, 3$

ii) $p(x) = \frac{x-2}{5}$, $x = 1, 2, 3, 4, 5$

d) For a discrete r.v. X, E (X) = 20 and Var (X) = 9. Find the positive values of 'a' and 'b' such that Y = aX – b has mean 0 and variance 1.

Q.5 Attempt **ANY FOUR** of the following: **[12]**

a) Give two real life situation where hypergeometric distribution is applicable.

b) Define median and mode of a discrete probability distribution.

c) The probability distribution of a discrete r.v. X is as follows:

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

Find : **i)** $P(X > 1 \mid X > 0)$ **ii)** E(X).

d) If A and B are independent with P(A) = 0.5, P(B) = 0.4.
Find : **i)** $P(A' \cap B)$ **ii)** $P(A' \cap B')$.

e) Let A and B be two events defined as sample space Ω such that $P(A) = \frac{1}{4}$, $P(B \mid A) = \frac{1}{2}$, $P(A \mid B) = \frac{1}{4}$. Prove that A and B are independent.

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