

**BACHELOR OF SCIENCE (CBCS-2018 COURSE)**  
**F. Y. B. Sc. Sem-I : WINTER :- 2021**  
**SUBJECT: STATISTICS : DISCRETE PROBABILITY & PROBABILITY**  
**DISTRIBUTIONS-I**

**Day : Thursday**  
**Date 3/2/2022**

**W-18311-2021**

**Time : 10:00 AM-01:00 PM**  
**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) Explain deterministic and non-deterministic experiments with illustrations.
- b) Let  $\Omega = \{a, b, c, d, e, f, g, h, i\}$ ,  $A = \{a, c, e, f\}$ ,  $B = \{b, d, e, g, h\}$ ,  
 $C = \{e, h, i\}$ . List the elements of the following events:  
i)  $A \cap B'$       ii)  $(A \cup B \cup C)'$       iii)  $(A \cap B) \cup C$
- c) A random experiment results in an integer outcome between 1 to 10. All the numbers are equally likely. Let A be the event that an odd number occurs and B be the event that a number is divisible by 3 occurs. Obtain:  
i)  $P(A|B)$       ii)  $P(A|B')$       iii)  $P(A'|B')$

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

- a) State and prove Baye's theorem for conditional probability.
- b) There are 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles in a bag. Suppose you select one marble at random. Find each of the following probability:  
i)  $P(\text{black})$       ii)  $P(\text{not green})$   
ii)  $P(\text{blue or black})$       iv)  $P(\text{not purple})$
- c) The probabilities of r.v. X taking values 0, 1, 2 are as follows:  
 $P(0) = 2k^3$ ,  $P(1) = 4k - 10k^2$ ,  $P(2) = 5k - 1$ . Find :  
i) k      ii)  $P(0 < X < 1)$       iii) Obtain the cumulative distribution function of X.

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

- a) If  $X \rightarrow$  Hypergeometric (N, M, n) find mean of X.
- b) If X and Y are independent binomial variates with  $X \rightarrow B(5, 1/2)$  and  $Y \rightarrow B(8, 1/2)$ , find:  
i)  $P(X+Y=5)$       ii)  $P\left(\frac{X+Y}{2} \geq 1\right)$       iii)  $P(3(X+Y) \leq 6)$ .
- c) The p.m.f. of r.v. X is,  
 $P(x) = \frac{1}{12}$ ,  $x = 1, 2, \dots, 12$ .  
Find : i)  $E(X)$       ii)  $\text{Var}(X)$       iii)  $\text{Var}(-3X+2)$

**P.T.O.**

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

- a) State and prove additive property of binomial distribution.
- b) Given the following distribution function of a r.v. X:

X	-3	-2	-1	0	1	2	3
F(x)	0.05	0.15	0.38	0.57	0.72	0.88	1

Find : **i)**  $P(-2 \leq X \leq 1)$       **ii)** The p.m.f. of X.

- c) A group of 10 football players contains 6 Maharashtrians and remaining Non-Maharashtrian. An Indian team of 7 players is to be formed. Find:
  - i)** Average number of Maharashtrians selected in the team.
  - ii)** Probability that 4 players from Maharashtra is selected.
- d) Let X follow a discrete uniform distribution over values 11, 12,.....20. Find mean and standard deviation of X.

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

- a) State the limitations of classical definition of probability.
- b) Let A and B be two independent events defined on sample space  $\Omega$ . The probability that at least one event out of A and B is 0.7, while the probability that A occurs is 0.5. Determine the probability that B occurs.
- c) For a Bernoulli random variable X with parameter p,  $\mu'_3 = 0.7$ . Find the value of p.
- d) If  $X \rightarrow B(5, 1/2)$ , find mean and mode of X.
- e) Define degenerate distribution and find its mean and variance.
- f) If A and B are independent then show that A and B' are independent.

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