

- (vi) Figures to the right indicate marks.
- Q.1. (a) Explain with the help of suitable examples : 10
 i) Sample Space
 ii) Event
 iii) Mutually Exclusive events
 iv) Complementary events
 v) Probability of an event.
- (b) A coin is tossed thrice. Describe the sample space for the experiment. Also 10
 write the subsets of the sample space corresponding to the events-
 A_1 : the last toss gives a head
 A_2 : heads and tails are alternate
 A_3 : the number of heads is less than number of tails
 A_4 : one more head occurs than the number of tails.
- (c) Two cards are drawn from a normal pack of 52 well-shuffled cards. Find the 10
 probability that the cards drawn are –
 i) both black
 ii) one black and one heart
 iii) both aces
 iv) one ace and one king
 v) both face cards
- (d) A problem is given to three students A, B and C whose chances of solving it 10
 are $1/2$, $1/3$ and $1/4$ respectively. If all of them try it independently, find the
 probability that the problem will be solved.
- Q.2. (a) Define Expectation $E(X)$ and Variance $V(X)$ of a discrete random variable 10
 X . Show that-
 i) $E(aX + b) = a E(X) + b$
 ii) $V(aX + b) = a^2 V(X)$, where a and b are constants.
- (b) The probability mass function of a random variate X is given by 10
 $P(x) = 1/6$ when $x=0$
 $= 2/3$ when $x=1$
 $= 1/6$ when $x=2$
 $= 0$ otherwise
 Find- (i) $p(x=0)$ (ii) $p(x=1)$ (iii) $p(x \text{ is even})$
 (iv) $p(x \text{ is multiple of } 5)$ (v) $p(x > 0)$
- (c) Following is joint probability distribution of X and Y . 10

$x \backslash y$	2	3	4
0	0.02	0.08	0.10
1	0.03	0.12	0.15
2	0.05	0.20	0.25

Examine whether X and Y are stochastically independent.

- (d) Calculate first three raw moments about origin and first three central moments for the following random variable X whose probability distribution function P(x) is given by- 10

x :	0	1	2
P(x) :	1/4	1/2	1/4

- Q.3. (a) If X is a Binomial variate with parameters n and p, write its probability mass function $P(X = x)$. Find $E(X)$. State variance of X. 10
- (b) A has won 20 out of 30 games of chess with B. In a new series of 6 games, what is the probability that A would win - 10
- (i) four or more games
- (ii) only four games?
- (c) On an average three divorce cases are filed in a court of a small city. Find the chance that on a certain day the number of such cases coming up would be - 10
- (i) one (ii) at least two (iii) at most two.
- Given- $e^{-3}=0.05$.
- (d) A digit is drawn at random from among the digits 1,2,3,4,5,6,7,8,9 and 0. If X denotes the digit drawn find $p(x)$, $E(X)$ and $V(X)$. 10

- Q.4. (a) A large box contains 30 colored balls of which 15 are red, 10 are white and the rest are black. One ball is drawn at random. Find the probability of drawing 5
- (i) a red ball (ii) a white ball
- (iii) a black ball (iv) a white or black ball.
- (b) A random variable X takes values -1, 0, 1 with probabilities 1/4, 1/2 and 1/4 respectively. Find the probability distribution function of random variables - 5
- (i) $Y = 2X - 1$ (ii) $Z = X^2$.
- (c) It is observed that 30% of the students in a class are swimmers. If 3 students are selected at random from this class, what is the chance that only one of them is a swimmer? 5
- (d) A variate X follows Poisson distribution with parameter 5. Evaluate (i) $p(x = 0)$ 5
- (ii) $p(x = 1)$ (iii) $p(x \geq 1)$ (iv) $p(x \neq 0)$. Given that $e^{-5} = 0.00674$.
