Time: 2 Hrs.30 Mins.   Marks: 75

N.B. (i) All questions are compulsory.

    (ii) Attempt ANY THREE sub questions out of FOUR in each question.

    (iii) Figures to the right indicate marks.

Q.1. (a) State and prove Multiplication Theorem on Probability. Also state the theorem if A and B are independent events.   8

    (b) One card is drawn from a full pack of well shuffled 52 playing cards. Find the probability that it is:-   8
      i) A spade card.
      ii) Either a diamond or a king card.
      iii) Red or an ace card.

    (c) A pair of uniform dice is thrown. Find the probability that :   7
      (p) the sum of the numbers obtained is -
        (i) a two digit number
        (ii) a multiple of 4
      (q) The product is an odd number.

    (d) The probability that a person stopping at a petrol pump will ask for petrol is 0.80, the probability that he will ask for water is 0.70 and the probability that he will ask for both is 0.65. Find the probability that a person stopping at this petrol pump will ask for-   7
      i) either petrol or water
      ii) neither petrol nor water
      iii) only petrol.

Q.2. (a) Define the following terms:-   8
      i) Raw moments.
      ii) Central moments.
      iii) Skewness.
      iv) Kurtosis.

    (b) Find K in the following case so that p(x) can be regarded as a probability distribution function.   8

X :	-1	0	1	2
P(X) :	$\frac{k+1}{13}$	$\frac{1}{13}$	$\frac{k}{13}$	$\frac{k-4}{13}$

Also find Expected value of X.

(c) If X and Y are two stochastically independent random variables with E(X) = 5, V(X) = 2, E(Y) = 12 and V(Y) = 3, Find – **7**

i) E(X+Y)

ii) E(2X + 3Y)

iii) E(XY)

iv) V(2X+3Y) .

(d) The probability mass function of a random variable X is **7**

P(x) = 1/2   when x=2

      = 3/10   when x=5

      = 1/5   when x=6

      = 0   otherwise

Find (i) p(2)   (ii) p(x is even)   (iii) p(x is multiple of 3)   (iv) p(x > 3)

Also find its cumulative probability distribution function.

Q.3. (a) Define a random variable X that follows discrete Uniform distribution. Obtain E(X) and V(X) of X. **8**

(b) 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? What is the chance that atleast one is a swimmer ? **8**

(c) In a factory bolts are packed in boxes of 500 each. It is known that on an average 0.1% of the bolts are defective. What is the chance that one such box consists of (i) no defective (ii) one defective (iii) two or more defectives? **7**

(d) A die is thrown with six numbers on its faces as 0,1,2,3,4 and 5.. Let X denotes the number on the uppermost face of the die. Find the probability distribution of X. Also find E(X) and V(X). **7**

Q.4. (a) A committee of 3 is to be formed from among 5 boys and 3 girls. What is the probability that the committee shall have – **5**

i) 2 boys and 1 girl

ii) at least one boy

(b) State the theorems on Expectation and prove any one of them. **5**

(c) A discrete random variable X takes values -2, 0 and 2 with probabilities 0.2, 0.5 and 0.3 respectively. Find the probability distribution function of - **5**

(i) Y = 2X + 1   (ii) Z = X^2 + 1

(d) A uniform die is rolled four times. Find the chance that it will show **5**

(i) no six   (ii) at least one six   (iii) all sixes.

———— X ————