

- N.B. :**
- 1) Attempt any three questions
 - 2) Figures to the right indicate full marks.
 - 3) Statistical tables will be provided on request

- Q.1** a) A ticket is drawn at random from hundred tickets numbered 1 to 40. What is the probability that the number on the ticket drawn is a
- i) perfect square
 - ii) multiple of 4 or 6
- 2
- b) Following is observed frequency distribution of marks in Mathematics (x) and marks in statistics (y) of 100 students of a class

| Marks in Mathematics (x) | Marks in statistics (y) | | | | |
|--------------------------------|-------------------------|---------|---------|---------|----------|
| | 0 - 20 | 20 - 40 | 40 - 60 | 60 - 80 | 80 - 100 |
| 0 - 20 | 3 | 1 | — | — | — |
| 20 - 40 | 6 | 8 | 7 | 5 | 2 |
| 40 - 60 | 3 | 5 | 10 | 10 | 5 |
| 60 - 80 | — | 5 | 10 | 8 | 1 |
| 80 - 100 | — | — | — | 4 | 7 |

Write down joint and marginal probability distributions.

If a randomly chosen student has at least 40 marks in statistics. What is the probability that he has less than 40 marks in mathematics.

4

- c) X and Y are two stochastically independent random variables with means 5 and 12 and variance 2 and 3 respectively. Find
- i) $E(x + y)$
 - ii) $E(2x + 3y)$
 - iii) $V(x + y)$
 - iv) $V(4x + 2y)$
- 4
- Q.2** a) The sales manager of an automobile dealer estimates that 90% of the new car delivered by them have no defect and so will not be brought back immediately for repair. He sells a fleet of 6 cars to an important customer. What is the probability that
- i) no car will be brought back
 - ii) all cars will be brought back
 - iii) One or more cars will be brought back for repairs.
- 4
- b) A radioactive source is observed during a time interval of six seconds. If the number of particles emitted during an interval of six seconds follows Poisson distribution with a rate of three particles emitted during an interval of six seconds follows Poisson distribution with a rate of three particles for interval, what is the chance that three or more particles will be emitted during the interval under consideration
- 3
- c) Calculate correlation between X & Y in the following case
- 3
- $$P(x, y) = \frac{x+y}{36}, \quad \begin{matrix} x = 1, 2, 3 \\ y = 1, 2, 3 \end{matrix}$$

Q.3 a) A die is thrown with six numbers on its faces as 1, 2, 3, 4, 5 and 6. Let X : Number on the uppermost face of the die. Find the probability distribution of X. Also find E(x) and V(x) 3

b) Suppose that the life time of a certain make of T.V tube is exponentially distributed. With a mean life 1600 hrs. What is the probability that
 i) the tube will work up to 2400 hrs ?
 ii) the tube will survive after 1000 hrs. 4

c) The distribution of number of words written per day by a certain writer over a period of one year showed Rectangular distribution over (1000, 2000). Find the chance that on a randomly chosen day of the year he wrote i) at least 1200 words.
 ii) anywhere from 1250 to 1750 words. 3

Q.4 a) For a continuous random variable X, its p.d.f. is given
 Find K, mean of X, standard deviation of X.
 $f(x) = Kx \quad 0 < x < 2$
 $= 0 \quad \text{O.W.}$ 5

b) The weights of 5000 N.C.C cadets are found to be normally distributed with mean = 50 kg & Sd = 5 kg. To improve the standard of the organisation it is decided to retain only those having weight between 42.5 kg & 65 kg. Find the number of cadets that will have to be discharged due to this decision. 5

Q.5 a) A pharmaceutical firm maintains that the mean time for a drug to show effect is 24 minutes. In a sample of 400 trials the mean time is 26 minutes with a standard deviation of 4 minutes. Test the hypothesis that the mean time is 24 minutes against the alternate that is not equal to 24 minutes. Use 5% level of significance. 3

b) The eyesight of 1000 randomly selected people from a town were tested with the following results.

| | | |
|--------|---------------|---------------|
| | Poor eyesight | Good eyesight |
| Male | 200 | 350 |
| Female | 210 | 250 |

Can we conclude at 5% level of significance that sex has no bearing on the quality of eyesight ? 3

c) An Urn contains 8 marbles of which an unknown number m are white. To test the hypothesis $H_0 : m = 4$ against the alternative $H_1 : m = 5$, following procedure is used. Draw two marbles from the urn without replacement and reject H_0 if both are white. Find the probability of the two types of error. 4

