

Question Paper consists of FIVE units, each carrying 12 marks
 Each unit has TWO questions; either of them should be answered
 All parts of a question must be answered at one place.

UNIT-I

Marks

1. a) A and B play 12 games of chess of which 6 are won by A, 4 are won by B, and 2 ends in a draw. They agree to play a tournament consisting of 3 games. Find the probability that (a) A wins all 3 games, (b) 2 games end in a draw, (c) A and B win alternately, (d) B wins at least 1 game 6M
- b) The following Table shows the distribution function of a random variable X. Determine (a) the probability function, (b) $P(X=3)$, (c) $P(X=2)$, (d) $P(X=4)$ 6M

x	1	2	3	4
$F(x)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{4}$	1

(OR)

2. a) A and B play a game in which they alternately toss a pair of dice. The one who is first to get a total of 7 wins the game. Find the probability that (a) the one who tosses first will win the game, (b) the one who tosses second will win the game. 6M
- b) The distribution function of a random variable X is given by 6M

$$F(x) = \begin{cases} cx^3 & 0 \leq x < 3 \\ 1 & x \geq 3 \\ 0 & x < 0 \end{cases}$$

If $P(x=0)=0$, find (a) the constant c, (b) the density function, (c) $P(x>1)$, (d) $P(1 < x < 2)$.

UNIT-II

3. a) The electric light bulbs of manufacturer A have a mean lifetime of 1400 hours with a standard deviation of 200 hours, while those of manufacturer B have a mean lifetime of 1200 hours with a standard deviation of 100 hours. If random samples of 125 bulbs of each brand are tested, what is the probability that the brand A bulbs will have a mean lifetime that is at least (a) 160 hours, (b) 250 hours more than the brand B bulbs? 6M
- b) The standard deviation of the weights of a very large population of students is 65 kg. Samples of 200 students each are drawn from this population, and the standard deviations of the weights in each sample are computed. Find (a) the mean, (b) the standard deviation of the sampling distribution of standard deviations 6M

(OR)

4. a) Ball bearings of a given brand weigh 50 grams with a standard deviation of 0.2 grams. What is the probability that two lots, of 1000 ball bearings each, will differ in weight by more than 2 grams? 6M
- b) A population consists of the four numbers 3, 7, 11, 15. Consider all possible samples of size two that can be drawn with replacement from this population. Find (a) the population mean, (b) the population standard deviation, (c) the mean of the sampling distribution of means, (d) the standard deviation of the sampling distribution of means 6M

UNIT-III

5. a) The manufacturer of a patent medicine claimed that it was 90% effective in relieving an allergy for a period of 8 hours. In a sample of 200 people who had the allergy, the medicine provided relief for 160 people. (a) Determine whether the manufacturer's claim is legitimate by using 0.01 as the level of significance. (b) What is the P value of the test? 6M
- b) A machine is constructed to produce ball bearings having a mean diameter of 0.574 inch and a standard deviation of 0.008 inch. To determine whether the machine is in proper working order, a sample of 6 ball bearings is taken every 2 hours and the mean diameter is computed from this sample, (a) Design a decision rule whereby one can be fairly certain that the quality of the products is conforming to required standards, (b) Show how to represent graphically the decision rule in (a). 6M

(OR)

6. a) The breaking strengths of cables produced by a manufacturer have mean 1800 kg and standard deviation 100 kg. By a new technique in the manufacturing process it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested, and it is found that the mean breaking strength is 1850 kg. (a) Can we support the claim at a 0.01 level of significance? (b) What is the P value of the test? 6M
- b) Over a long period of time the grades given by a group of instructors in a particular course have averaged 12% A's, 18% B's, 40% C's, 18% D's, and 12% F's. A new instructor gives 22 A's, 34 B's, 66 C's, 16 D's, and 12 F's during two semesters. Determine at a 0.05 significance level whether the new instructor is following the grade pattern set by the others. 6M

UNIT-IV

7. a) Find the greatest common divisor of 414 and 662 using the Euclidean algorithm. 6M
- b) Determine whether the integers 10, 17, and 21 are pairwise relatively prime and whether the integers 10, 19, and 24 are pairwise relatively prime. 6M

(OR)

8. a) Consider the group $G = \{1,2,3,4,5,6\}$ under multiplication modulo 7. 6M
- (a) Find the multiplication table of G. (b) Find $2^{-1}, 3^{-1}, 6^{-1}$. (c) Find the orders and subgroups generated by 2 and 3. (d) Is G cyclic?
- b) Let G be an abelian group and let n be a fixed positive integer. Show that the function $f: G \rightarrow G$ defined by $f(a) = a^n$ is a homomorphism. 6M

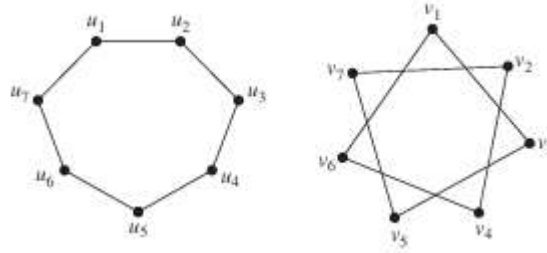
UNIT-V

9. a) Draw the multi graph G corresponding to each of the following adjacency matrix 6M

$$A = \begin{bmatrix} 1 & 1 & 1 & 2 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 2 \\ 2 & 0 & 2 & 2 \end{bmatrix}$$

b) Test whether the following graphs are isomorphic?

6M



(OR)

10. a) Construct a niche overlap graph for six species of birds, where the hermit thrush competes with the robin and with the blue jay, the robin also competes with the mockingbird, the mockingbird also competes with the blue jay, and the nuthatch competes with the hairy wood pecker. 6M

b) Find the chromatic number of the following graph. 6M

