



Department of Computer Science Engineering

QUESTION BANK

Subject – P&S

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Branch – II CSE I Sem

UNIT – I

- (a) Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each drawing. Find the probability that i. both are white ii. first is red and second is white

(b) a businessman goes to hotels X, Y, Z ; 20% , 50% , 30% of the time respectively. It is known that 5% , 4% , 8% of the rooms in X, Y, Z hotels have faulty plumbing. What is the probability that businessmans room having faulty plumbing is assigned to hotel Z. [8+8]
- (a) If A and B are events with $P(A) = 1/3$, $P(B) = 1/4$, and $P(A \cup B) = 1/2$, find i. $P(A/B)$ ii. $P(A \setminus B)$

(b) Three students A,B,C are in a running race. A and B have the same probability of wining and each is twice as likely to win as C. Find the probability that B or C wins.

(c) The students in a class are selected at random one after the other for an examination. Find the probability that the boys and girls are alternate if there are i. 5 boys and 4 girls ii. 4 boys and 4 girls.
- (a) Define finite equiprobable space.

(b) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability p that the sum is odd if i. The two cards are drawn together. ii. The two cards are drawn one after the other without replacement iii. The two cards are drawn one after the other with replacement
- (a) The probability that a regularly scheduled flight departs on time is $P(D) = 0.83$, the probability that it arrives on time is $P(A) = 0.82$ and the probability that it departs and arrives on time is $P(D \cap A) = 0.78$. Find the probability that a plane i. arrives on time given that it departed on time and ii. departed on time given that it has arrived on time.

(b) One bag contains 4 White balls and 3 black balls and a second bag contains 3 white balls and 5 black balls. One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is black?
- (a) Define a random experiment, sample space, event and mutually exclusive events. Give examples of each.

(b) Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. i. If a marble is drawn from each box, what is the probability that they are both of the same color?
- (a) If the probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18. What is probability that a system will high fidelity will also have high selectivity.

(b) If the probability that a research project will be well planned is 0.80 and the probability that it will be planned and well executed is 0.72. What is the probability that a research project that is well planned will also be well executive.
- (a) If $P(A) = a$, $P(B) = b$, $P(A \setminus B) = c$, express the following in terms of a, b, and c i. $P(A \setminus B)$ ii. $P(A \setminus B)$ iii. $P(A \setminus (A \cap B))$ iv. $P[(A \cup (A \setminus B))]$

(b) Box A contains nine cards numbered 1 to 9 and box B contains five cards numbered 1 to 5. A box is chosen at random and a card is drawn, if the card shows an even number another card is drawn from the same box, if the card shows an odd number a card is drawn from the other box. i. What is the probability that both cards show even numbers? ii. If both cards show even numbers, what is the probability that they come from box A. iii. What is the probability that both cards show an odd number?
- (a) Of the three men, the chances that a politician, a businessman or an academician will be appointed as a Vice-chancellor (V.C.) of a University are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C. are 0.3, 0.7, 0.8 respectively. i. Determine the probability that research is promoted ii. If research is promoted, what is the probability that V.C. is an academician

(b) There are two boxes in box I, 11 cards are there numbered 1 to 11 and in box-II, 5 cards numbered 1 to 5. A box is chosen and a card is drawn. If the card shows an even number then another card is drawn from the same

- box. If card shows an odd number another card is drawn from the other box. Find the probability that i. both are even ii. both are odd iii. if both are even. What is the probability that they are from box-I.
9. (a) If A and B are events with $P(A) = 1/3$, $P(B) = 1/4$, and $P(A \cup B) = 1/2$, find i. $P(A/B)$ ii. $P(A \setminus B^c)$
 (b) Three students A,B,C are in a running race. A and B have the same probability of winning and each is twice as likely to win as C. Find the probability that B or C wins.
 (c) The students in a class are selected at random one after the other for an examination. Find the probability that the boys and girls are alternate if there are i. 5 boys and 4 girls ii. 4 boys and 4 girls.
10. (a) If probability density function $f(x) = kx^3$ in $0 \leq x \leq 3 = 0$ elsewhere Find the value of K and find the probability between $x=1/2$ and $x=3/2$.
 (b) A random variable X has the following probability distribution. X: 1 2 3 4 5 6 7 8 f(x): K 2K 3K 4K 5K 6K 7K 8K Find the value of i. K ii. $P(x \leq 2)$ iii. $P(2 \leq x \leq 5)$.
11. (a) If X is a continuous random variable and K is a constant then prove that i. $\text{Var}(X+K) = \text{Var}(X)$ ii. $\text{Var}(kX) = k^2 \text{Var}(X)$
 (b) Determine the probability of getting 9 exactly twice in 3 throws with a pair of fair dice. [8+8]
12. (a) In 100 sets of ten tosses of an unbiased coin, in how many cases should we expect i. Seven heads and three tails ii. At least seven heads?
 (b) An office switch board receives telephone calls at the rate of 3 calls per minute on an average. What is the probability of receiving
13. (a) Define Poisson distribution. Find its mean and variance.
 (b) Out of 2000 families with 4 children each, how many would you expect to have? i. at least one boy ii. Exactly two boys iii. no girls.
14. (a) Let F(x) be the distribution function of a random variable X given by $F(x) = cx^3$ when $0 \leq x < 3 = 1$ when $x \geq 3 = 0$ when $x < 0$. If $P(X=3) = 0$ Determine i. C ii. Mean iii. $P(x > 1)$
 (b) A student takes a true false examination consisting of 8 questions. He guesses each answer. The guesses are made at random. Find the smallest value of n that the probability of guessing at least n correct answers is less than $1/2$.
15. (a) The mean and variance of a binomial distribution are 4 and $4/3$ respectively. Find $P(X \leq 1)$.
 (b) The mark of 1000 students in a University are found to be normally distributed with mean 70 and S.D 5. Estimate the number of students whose marks will be i. between 60 and 75 ii. more than 75 iii. less than 68.
16. (a) Of the three men, the chances that a politician, a businessman or an academician will be appointed as a Vice-chancellor (V.C.) of a University are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C. are 0.3, 0.7, 0.8 respectively. i. Determine the probability that research is promoted ii. If research is promoted, what is the probability that V.C. is an academician
 (b) There are two boxes in box I, 11 cards are there numbered 1 to 11 and in box-II, 5 cards numbered 1 to 5. A box is chosen and a card is drawn. If the card shows an even number then another card is drawn from the same box. If card shows an odd number another card is drawn from the other box. Find the probability that i. both are even ii. both are odd iii. if both are even. What is the probability that they are from box-I. [8+8]
17. (a) If X and Y are discrete random variables and K is a constant then prove that. i. $E(X + K) = E(X) + K$ ii. $E(X+Y) = E(X) + E(Y)$ (b) Out of 800 families with 5 childrens each, how many would you expect to have i. 3 boys ii. At least one boy. [8+8]
18. (a) If A and B are any two arbitrary events of the sample space then Prove that $P(A \cup B) = P(A) + P(B) - P(A \setminus B)$
 (b) A problem in statistics is given to three students A,B,C whose chances of solving it are 1,2, 3,4 and 1, 4 respectively. What is the probability that the problem is solved.
 (c) Find the probability of getting a sum of 10 if we throw two dice. [5+5+6]
19. (a) If F(x) is the distribution function of X given by $F(x) = 0$ if $x \leq 1 = k(x-1)^4$ if $1 < x \leq 3 = 1$ if $x > 3$ determine i. f(x) ii. K iii. Mean
 (b) Find the maximum n such that the probability of getting no head in tossing a coin n times is greater than .1
20. (a) If 3 cars drawn from a lot of 6 cars containing 2 defective cars, i. Find the probability distribution of the number of defective cars. ii. For the discrete probability distribution. X 0 1 2 3 4 5 6 7 f 0 k 2k 2k 3k k2 2k2 7k2+k Determine A. k B. mean C. variance iii. Expected no. of defective items.
 b) For the discrete probability distribution. X 0 1 2 3 4 5 6 7 f 0 k 2k 2k 3k k2 2k2 7k2+k Determine i. K ii. Mean iii. variance.
21. (a) Prove that i. $P(A^c) = 1 - P(A)$ ii. $P(B) \leq P(A)$ when $B \subseteq A$
 (b) A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the probability that i. 3 boys are selected ii. exactly 2 girls are selected [8+8]

22. (a) Probability density function of a random variable $X = \frac{1}{2} \sin x$ in $0 \leq x \leq \pi = 0$ else where. Find the mean, mode and median for the distribution and also find the probability between 0 and 2
 (b) Two dice are thrown 5 times. If getting a double is a success. Find the probability that getting the success i. atleast once ii. Two times.
23. (a) A class has 10 boys and 5 girls. Three students are selected at random one after the other. Find the probability that i. first two are boys and third is girl ii. first and third of same sex and second is of opposite sex.
24. (b) A box contains n tickets marked 1 through n. Two tickets are drawn without replacement. Determine the probability that the number on the tickets are consecutive integers. [8+8]
25. (a) Two dice are thrown. Let X the random variable assign to each point (a,b) in S the maximum of its numbers. Find the distribution, the mean and variance of the distribution.
 (b) Ten coins are tossed simultaneously. Find the probability of getting at least 7 heads.
26. (a) If X is a continuous random variable and K is a constant then prove that i. $\text{Var}(X+K) = \text{Var}(X)$ ii. $\text{Var}(kX) = k^2 \text{Var}(X)$
 (b) Determine the probability of getting 9 exactly twice in 3 throws with a pair of fair dice.
27. (a) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that the sum is even if i. the two cards are drawn together ii. the two cards are drawn one after the other with replacement.
 (b) State and prove Baye's theorem.
 (c) The probabilities of A,B,C to become M.D'S of a factory are 5,10,3,10,2,10. The probabilities that bonus scheme will be introduced if they become M.D's are .02, .03 and .04. Find the probabilities A,B,C to be become M.D's if bonus scheme introduced. [5+5+6]
28. (a) Two dice are thrown. Let X the random variable assign to each point (a,b) in S the maximum of its numbers. Find the distribution, the mean and variance of the distribution.
 (b) Ten coins are tossed simultaneously. Find the probability of getting at least 7 heads.
29. (a) Of the three men, the chances that a politician, a businessman or an academician will be appointed as a Vice-Chancellor (V.C.) of a University are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C. are 0.3, 0.7, 0.8 respectively. i. Determine the probability that research is promoted ii. If research is promoted, what is the probability that V.C. is an academician
 (b) There are two boxes in box I, 11 cards are there numbered 1 to 11 and in box II, 5 cards numbered 1 to 5. A box is chosen and a card is drawn. If the card shows an even number then another card is drawn from the same box. If card shows an odd number another card is drawn from the other box. Find the probability that i. both are even ii. both are odd iii. if both are even. What is the probability that they are from box I. [8+8]
30. (a) Define random variable, discrete probability distribution, continuous probability distribution and cumulative distribution. Give an example of each.
 (b) The mean of Binomial distribution is 3 and the variance is 9 Find i. The value of n ii. $p(x \geq 7)$ iii. $p(1 \leq x < 6)$.
31. (a) If A and B are any two arbitrary events of the sample space then Prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
 (b) A problem in statistics is given to three students A,B,C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. What is the probability that the problem is solved.
 (c) Find the probability of getting a sum of 10 if we throw two dice. [5+5+6]
32. (a) For the continuous probability function $f(x) = kx^2 e^{-x}$ when $x \geq 0$ find i. K ii. Mean iii. Variance
 (b) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random. i. none is defective ii. one is defective iii. $p(1 < x < 4)$ [8+8]

UNIT –II

1. (a) Using recurrence formula find the probabilities when $x=0,1,2,3,4$ and 5; if the mean of Poisson distribution is 3.
 (b) If the masses of 300 students are normally distributed with mean 68Kgs and standard deviation 3 Kgs. How many students have masses. i. Greater than 72 Kg ii. Less than or equal to 64 Kg iii. Between 65 and 71 Kg inclusive.
2. (a) Out of 800 families with 5 children each, how many would you expect to have i. 3 boys ii. Either 2 or 3 boys
 (b) Average number of accidents on any day on a notional highway is 1.6 Determine the probability that the number of accidents are i. at least one ii. at most one.

3. (a) Wireless sets are manufactured with 25 soldered joints each. On the average 1 joint in 500 is defective. How many sets can be expected to be from defective joints in a consignment of 10,000 sets. (b) The mean and variable of binomial distribution are 4 and $\frac{4}{3}$ respectively. Find $P(x \leq 1)$.
4. (a) If the probability is 0.05 that a certain wide-flange column will fail under a given axial load. What are the probability that among 16 such columns i. at most two will fail ii. at least four will fail
(b) If the chance that any of the 10 telephone lines is busy at an instant is 0.2. what is the most probable number of busy lines and what is the probability of this number.
5. (a) The average number of phone calls/minute coming into a switch board between 2 p.m. and 4. p.m. is 2.5. Determine the probability that during one particular minute there will be i. 4 or fewer ii. more than 6 calls
(b) The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine i. how many students got marks above 90% ii. what was the highest mark obtained by the lowest 10% of the student iii. within what limits did the middle of 90% of the students lie
6. (a) If the variance of a poisson variate is 3. Find the probability that i. $X=0$ ii. $1 \leq x < 4$ iii. $0 < x \leq 3$
7. (b) Given that the mean heights of students in a class is 158 cms with standard deviation of 20cms. Find how many students heights lie between 150 cms and 170 cms, if there are 100 students in the class.
8. (a) Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents are i. at least one ii. at most one
(b) If X is a normal variate, Find the probability i. to the left of $z = -1.78$ ii. to the right of $z = -1.45$ iii. corresponding to $-0.80 \leq z \leq 1.53$ iv. to the left of $z = -2.52$ and to the right of $z = 1.83$
9. (a) The diameter of an electric cable is assumed to be a continuous random variable X with pdf $f(x) = 6x(1-x)$; $0 \leq X \leq 1$, i. Check whether $f(x)$ is really a pdf ii. Determine b such that $P(X < b) = P(X > b)$.
(b) X is a normal variable with mean 30 and S.D 5. Find the probability that i. $26 \leq X \leq 40$ ii. $X \geq 45$ and iii. $X - 30 > 5$
10. (a) The amount of bread (in hundreds of pounds) X that a certain bakery is able to sell in a day is found to be a random variable, whose density function is given by $f(x) = Ax$ for $0 \leq x < 5 = A(10 - x)$ for $5 \leq x < 10 = 0$, otherwise. Find the value of A such that $f(x)$ is a probability density function. What is the probability that the number of pounds of bread that will be sold tomorrow is i. more than 500 pounds ii. between 250 and 750 pounds.
(b) Derive normal distribution as limiting case of binomial distribution, clearly stating the conditions involved
11. (a) A Poisson distribution has a double mode at $x = 2$ and $x = 3$, find the maximum probability and also find $p(x = 2)$.
(b) The weekly wages of 1000 workers are normally distributed around a mean of Rs.70 and S.D of Rs.5/Estimate the number of workers whose weekly wages will be i. between Rs.70 and Rs.72 ii. between 69 and 72 iii. More than 80
12. (a) Define Poisson distribution and find its variance and the mean.
(b) Find the mean and standard deviation of a normal distribution in which 7% of items are under 35 and 89% are under 63.
13. (a) The mean diameter is 12 mm and standard deviation 0.02 mm in a sample of 200 washers produced by a machine. Find the percentage of washers produced whose diameters lie i. within 11.97 to 12.03 mm ii. Outside 11.97 and 12.03 mm
(b) Suppose the heights of American men are normally distributed with mean=68 inches and standard deviation 2.5 inches. Find the percentage of people whose heights lie between i. 66 inches and 71 inches ii. at least 6ft.
14. (a) Seeds are packed in packets of 20. It is known that 5% do not germinate. Determine the number of packets containing i. at least 2 ii. at most 2 non germinating seeds in a consignment of 1000 packets.
(b) When the mean of marks was 50% and standard deviation 5% then 60% of the students failed in mathematics examination. Determine the 'grace' marks to be awarded in order to show that 70% of the students passed, assuming that the marks are normally distributed.
15. (a) From a lot of 10 items containing 3 defective, a sample of 4 items is drawn at random. Let the random variable X denote the number of defective items in the sample. If the sample is drawn without replacement i. Find the probability distribution of X ii. Find $P(X \leq 1)$ and $P(0 < X < 2)$.
(b) Define normal distribution. Find its mean and variance
16. (a) If x is a Poisson variate such that $3p(x = 4) = 12p(x = 2) + p(x = 0)$ find i. the mean of x ii. $p(x = 2)$
(b) Prove that the mean = mode = median for a normal distribution.
17. (a) Find the probability that at most 5 defective components will be found in a lot of 200 if experience shows that 2% of such components are defective. Also find the probability of more than five defective components.
(b) Write the importance of normal distribution.

- (c) If the mean and S.D of normal distribution are 70 and 16, find $p(x=38) < x < p(x=46)$
18. (a) If for a poisson variate $2p(x=0) = P(x=2)$. Find the probability that i. $p(x \leq 3)$ ii. $P(2 < x \leq 5)$
 (b) Show that the mean deviation from the mean equals (approximately) to $4/3$ of standard deviation for normal distribution.
19. (a) If the variance of a poisson variate is 3. Find the probability that i. $X=0$ ii. $1 \leq x < 4$ iii. $0 < x \leq 3$
 (b) Given that the mean heights of students in a class is 158 cms with standard deviation of 20cms. Find how many students heights lie between 150 cms and 170 cms, if there are 100 students in the class.

UNIT – III

1. Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6 with replacement. Find (a) The mean of the population
 (b) Standard deviation of the population
 (c) The mean of the sampling distribution of means
 (d) The standard deviation of the sampling distribution of means. [16]
2. (a) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval?
 (b) Measurements of the weights of a random sample of 200 ball bearing made by a certain machine during one week showed a mean of 0.824 and a standard deviation of 0.042. Find maximum error at 95% confidence interval?
3. A random sample of 10 boys had the following IQ's 70, 120, 110, 101, 88, 83, 95, 98, 107, 100.
 (a) Do these data support the assumptions of a population mean IQ of 100?
 (b) Find a reasonable range in which most of the mean IQ values of samples of 10 boys lie.
4. (a) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval. Find the confidence limits for the mean if $\bar{x} = 82$?
 (b) Measurements of the weights of a random sample of 200 ball bearing made by a certain machine during one week showed a mean of 0.824 and a standard deviation of 0.042. Find maximum error at 95% confidence interval. Find the confidence limits for the mean if $\bar{x} = 32$? [8+8]
5. Let $u_1 = (3, 7, 8)$, $u_2 = (2, 4)$. Find (a) μ_1 (b) μ_2 (c) Mean of the sampling distribution of the differences of means $\mu_1 - \mu_2$ (d) σ_1 (e) σ_2 (f) the standard deviation of the sampling distribution of the differences of means ($\sigma_1 - \mu_2$)
6. (a) The mean and standard deviation of a population are 11795 and 14054 respectively, what can one assert the 95% confidence about the maximum error if $\bar{x} = 11795$ and $n = 50$. Find the confidence limits for the mean if $\bar{x} = 84$?
 (b) Find 95% confidence limits for the mean of a normality distribution population from which the following sample was taken 5, 17, 10, 18, 16, 9, 7, 11, 13, 14?
7. Determine the mean and standard deviation of sampling distributions of variances for the population 3, 7, 11, 15 with $n=2$ and the sampling is with replacement.
8. (a) Define i. Estimate ii. Estimator iii. Estimation
 (b) Explain about "Point Estimation".
9. (a) A lady stenographer claims that she can take dictation at the rate of 118 words per minute can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words and a S.D of 15 words.
 (b) In a large consignment of oranges a random sample of 64 oranges revealed that 14 oranges were bad. If it reasonable to ensure that 20% of the oranges are bad?
10. Samples of size 2 are taken from the population 4, 8, 12, 16, 20, 24 without re-placement. Find (a) mean of the population
 (b) standard deviation of population
 (c) the mean of sampling distribution of means
 (d) standard deviation of sampling distribution of means. [16]
11. (a) A sample of 100 iron bars is said to be drawn from a large number of bars. Whose lengths are normally distributed with mean 4 feet and S.D 0.6ft. If the sample mean is 4.2 ft, can the sample be regarded as a truly random sample?
 (b) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Within the 98% confidence limits for the percentage number of bad apples in the consignment.
12. (a) A random sample of size 81 is taken from an infinite population having the mean 65 and standard deviation 10. What is the probability that \bar{x} will be between 66 and 68?

- (b) Write about i. Critical region ii. Two tailed test.
13. (a) A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95% confidence.
 (b) Among 900 people in a state 90 are found to be chapatti eaters. Construct 99% confidence interval for the true proportion.
 (c) A random sample of 1200 apples was taken from a large consignment and found that 10% of them are bad. The supplier claims that only 2% are bad. Test his claim at 95% level.
14. (a) In a study of an automobile insurance a random sample of 80 body repair costs had a mean of Rs. 472.35 and a standard deviation of Rs 62.35. If \bar{x} is used as a point estimate to the true average repair costs, with what confidence we can assert that the maximum error doesn't exceed Rs. 10. Find also the confidence interval with that confidence.
 (b) A manufacturer of electric bulbs claims that the percentage defectives in his product doesn't exceed 6. A sample of 40 bulbs is found to contain 5 defectives. Would you consider the claim justified?
15. (a) A random sample of size 25 from a normal population has the mean $\bar{x} = 47.5$ and the standard deviation $s = 8.4$. Does this information support or refute the claim that the mean of the population is $\mu = 42.1$? (b) A manufacturer of electric bulbs claims that the percentage of defectives in his product does not exceed 6. A sample of 20 bulbs is found to contain 5 defectives. Would you consider the claim justified.
16. (a) In a batch chemical process, two catalysts are being compared for their effect on the output of the process reaction. A sample of 12 batches was prepared using catalyst 1 and a sample of 10 batches was obtained using catalyst 2. The 12 batches for which catalyst 1 was used gave an average yield of 85 with a sample standard deviation of 4, and the second sample gave an average of 81 and a sample standard deviation of 5. Find a 90% confidence interval for the difference between the population means, assuming that the populations are approximately normally distributed with equal variances.
 (b) A coin is tossed 10,000 times and it turns up head 5195 times. Discuss whether the coin may be regarded as unbiased one
17. (a) If measurements of the specific gravity of a metal can be looked upon as a sample from a normal population having a standard deviation 0.04, what is the probability that the mean of a random sample of size 25 will be "off" by at most 0.02?
 (b) A normal population has a variance of 15. If the samples of size 5 are drawn from this population, what percentage can be expected to have variances? i. less than 10 ii. between 5 and 10
18. (a) Write about i. Null hypothesis ii. Alternate Hypothesis.
 (b) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the significance at .05 level.
19. (a) A random sample of size 81 was taken whose variance is 20.25 and mean 32 construct 98% confidence interval
 (b) A manufacturer claims that only 4% of his products are defective. A random sample of 500 were taken among which 100 defective Test the hypothesis at .05 level
20. (a) The mean of certain normal population is equal to the standard error of the mean of the samples of 64 from that distribution. Find the probability that the mean of the sample size 36 will be negative.
 (b) A sample of 64 students have a mean weight of 70kgs. Can this be regarded as a sample from a population with mean weight 65kgs and standard deviation 25kgs
21. (a) A lady stenographer claims that she can take dictation at the rate of 118 words per minute can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words and a S.D of 15 words
 (b) In a large consignment of oranges a random sample of 64 oranges revealed that 14 oranges were bad. Is it reasonable to ensure that 20% of the oranges are bad?
22. A population consists of 5,10,14,18,13,24 consider all possible samples of size two which can be drawn without replacement from the population. Find
 (a) The mean of the population.
 (b) The standard deviation of the population.
 (c) The mean of the sampling distribution of means
 (d) The standard deviation of sampling distribution of means
23. (a) In a random sample of 125 cola drinkers, 68 said they prefer thumps up to Pepsi. Test the null hypothesis $p = .5$ against the alternate hypothesis $p > .5$

- (b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs. 48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502?
24. (a) If the distribution of all weights of all men traveling by train from Hyderabad to Delhi has a mean of 70 kgs and a standard deviation of 4 kgs, what is the probability that the combined gross weight of 36 such men is more than 300 kgs. spends less than 10 hours in a week on his own academic schedule. The figures for the time spent during a week are given below for 12 teachers: 7.1 13.1 7.8 3.6 8.4 4.9 9.6
3.4 0.1 7.2 20.3 11.1 Is the claim justified with the level of significance of 0.05?
25. (a) The mean and the standard deviation of a population are 11,795 and 14054 respectively. If $n=50$, find 95% confidence interval for the mean (b) In a city 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers.
26. (a) 500 articles were selected at random out a batch containing 10000 articles and 30 were found to be defective. How many defective articles would you reasonably expect to have in the whole batch?
(b) Out of consignment of 100000 tennis balls 496 were selected at random and examined and it was found that 20 of these were defective. How many defective balls can you reasonably expect to have in the whole consignment at 95% confidence level?
27. (a) In a sample of 600 men from a certain large city 450 are found to be smokers. 'In one of 900 from another city 450 are smokers. Do the data indicate that the cities are significantly different with respect 'to prevalence of smoking among men?
(b) Random samples of 400 men and 600 women in a locality were asked whether they would like to have a bus stop 'near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposals are same in the male and female. Discuss at 5% level of significance.
28. (a) The mean and the standard deviation of a population are 11,795 and 14,054 respectively. If $n=50$, find 95% confidence interval for the mean
(b) In a city 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers.
29. If the population is 3,6,9,15,27.(a) List all possible samples of size 3 that can be taken without replacement from the finite population. (b) Calculate the mean of each of the sampling distribution of means. (c) Find the standard deviation of sampling distribution of means. [5+5+6]
30. (a) A random sample of 400 flower stems has an average length of 15 cms. Can this be regarded as a sample from a large population with mean 16 cms and S.D 5 cms.
(b) 20 people were attacked by a disease and only 18 survived will you reject the hypothesis that the survival rate if attached by this disease is 85% in favour of the hypothesis that is more at 5% level.

UNIT – IV

1. (a) Write the formula for testing the hypothesis concerning "Two Means".
(b) The research investigator was interested in studying whether there is a significant difference in the salaries of MBA grades in two metropolitan cities. A random sample size 100 from Mumbai yields on average income of Rs.20,150. Another random sample of 60 from Chennai results in an average income of Rs.20,250. If the variances of both the populations are given as $\sigma^2_1 = \text{Rs.}40,000$ and $\sigma^2_2 = \text{Rs.}32,400$ respectively.
2. (a) What is meant by Level of significance ?
(b) Write the formula for testing the hypothesis concerning "Two Means"?
3. A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there 150 students having mean IQ of 75 with a S.D of 15 in the second group there are 250 students having mean IQ of 70 with S.D of 20. Test whether the groups have come from same population (Use α as 0.01) IQ test on two groups of boys and girls gave the following results. Mean of Girls = 78, S.D = 10, $n=30$ Mean of Boys = 78, S.D = 13, $n=70$ Is there any significance in the mean score of girls and boys at 5% Level of significance?
4. a) It is desired to test the hypothesis $\mu_0 = 40$ against the alternative hypothesis $\mu_1 = 42$ on the basis of a random sample from a normal population with the standard deviation $s=4$. If the probability of a Type 1 error is to be 0.05 and the probability of a Type II error is to be 0.24, find the required size of the sample.
(b) The diameter of rotor shafts in a lot has a mean of 0.249 inch and a standard deviation of 0.003 inch. The inner diameters of bearings in another lot have a mean of 0.255 inch and a standard deviation of 0.002 inch.

5. (i) What are the mean and the standard deviation of the clearances between shafts and bearings selected from these lots? (ii) If a shaft and a bearing are selected at random, what is the probability that the shaft will not fit inside the bearing? (Assume that both dimensions are normally distributed)
6. A large electronic firm that hires many workers with disabilities wants to determine whether their disabilities affect such workers performance. Use the level of significance of $\alpha = 0.05$ to decide on the basis of the following data, whether it is reasonable to maintain that the disabilities have no effect on the worker's performance. Above average Below average
- | | | | |
|---------------|----|----|----|
| Blind | 21 | 64 | 17 |
| Deaf | 16 | 49 | 14 |
| No disability | 29 | 93 | 28 |
7. The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety programme was put into operation:
- | | | | | | | | | | | |
|---------|----|----|----|-----|----|----|----|----|----|----|
| Before: | 45 | 73 | 46 | 124 | 33 | 57 | 83 | 34 | 26 | 17 |
| After: | 36 | 60 | 44 | 119 | 35 | 51 | 77 | 29 | 24 | 11 |
- Test whether the safety programme is effective in reducing the number of accidents at the level of significance of 0.05?
8. Four methods are under development for making discs of a super conducting material. Fifty discs are made by each method and they are checked for super conductivity when cooled with liquid. 1st Method 2nd Method 3rd Method 4th Method
- | | | | | |
|------------------|----|----|----|----|
| Super Conductors | 31 | 42 | 22 | 25 |
| Failures | 19 | 8 | 28 | 25 |
- Test the significant difference between the proportions of Superconductors at .05 level. [16]
9. (a) The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.
- | | | | | | |
|--------|------|------|------|------|------|
| Unit-A | 14.1 | 10.1 | 14.7 | 13.7 | 14.0 |
| Unit-B | 14.0 | 14.5 | 13.7 | 12.7 | 14.1 |
- (b) The following are the samples of skills. Test the significant difference between the means at .05 level. [8+8]
- | | | | | | | |
|-----------|------|------|------|------|------|------|
| Sample-I | 74.1 | 77.7 | 74.4 | 74 | 73.8 | |
| Sample-II | 70.8 | 74.9 | 74.2 | 70.4 | 69.2 | 72.2 |
10. Measurements of the fat content of two kinds of ice creams brand A and brand B yielded the following sample data.
- | | | | | | |
|---------|------|------|------|------|------|
| Brand A | 13.5 | 14.0 | 13.6 | 12.9 | 13.0 |
| Brand B | 12.9 | 13.0 | 12.4 | 13.5 | 12.7 |
- Test the significant between the means at 0.05 level.
11. (a) It has been suggested that an average college teacher in Andhra Pradesh spends less than 10 hours in a week on his own academic schedule. The figures for the time spent during a week are given below for 12 teachers.
- | | | | | | | | | | | | |
|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| 7.1 | 13.1 | 7.8 | 3.6 | 8.4 | 4.9 | 9.6 | 3.4 | 0.1 | 7.2 | 20.3 | 11.1 |
|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
- Is the claim justified with the level of significance of 0.05?
- (b) Test of the fidelity and the selectivity of 190 radio receivers produced the results shown in the following table:
- | | | | |
|---------------|---------|------|----|
| Fidelity | | | |
| Low | Average | High | |
| Low | 6 | 12 | 32 |
| Selectivity # | Average | 33 | 61 |
| High | 13 | 15 | 0 |
12. The following is the distribution of hourly number of trucks arriving at a company's warehouse;
- | | | | | | | | | | |
|---------------|----|-----|-----|-----|----|----|---|---|---|
| No. of Trucks | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Frequency | 52 | 151 | 130 | 102 | 45 | 12 | 5 | 1 | 2 |
- Find the mean of this distribution, and using it as parameter λ , fit a Poisson distribution. Test for goodness of fit at the 0.05 level of significance?
13. (a) A random sample from a company's very extensive files shows that the orders for a certain kind of machinery were filed, respectively in 10,12,19,14,15,18,11 and 13 days. Use the level of significance $\alpha=0.01$ to test the claim that on the average such orders are field in 10.5 days. Assume normality?
- (b) The results of polls conducted 2 weeks and 4 weeks before a election are shown in the following table: Two weeks before election Four weeks before election
- | | | |
|--------------------------|----|----|
| For Republican candidate | 79 | 91 |
| For Democratic candidate | 84 | 66 |
| Undecided | 37 | 43 |

Use the 0.05 level of significance to test whether there has been a change in opinion during the 2 weeks between the poll.

14. (a) The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1

(b) The following are the samples of skills. Test the significant difference between the means at .05 level.

Sample-I	74.1	77.7	74.4	74	73.8	-
Sample-II	70.8	74.9	74.2	70.4	69.2	72.2

15. The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety programme was put into operation:

Before: 45 73 46 124 33 57 83 34 26 17

After: 36 60 44 119 35 51 77 29 24 11 Test whether the safety programme is effective in reducing the number of accidents at the level of significance of 0.05?

UNIT - V

- A random sample of a size 25 from a normal population has the mean $\bar{x}=47.5$ and the $SD=8.4$. Does this information tends to support or refute the claim that the mean of the population $\mu=42.5$?
- A Random sample of 6 steel beams has a mean compressive strength of 58392 p.s.i (pounds per square inch) with a standard deviation of 648p.s.i. Use this information on the level of significance $\alpha=0.05$ to test whether the true average of compressive strength of the steel from which this sample came is 58000 p.s.i. Assume normally.
- A Random sample from a company's very extensive files .Shows that the order for a certain kind of machinery were filled, respectively 10,12,19,14,15,18,11,and 13 days. Use the level of significance $\alpha=0.01$ to test the claim that on the average such orders or filled him 10.5 days. Assume normality?
- Two horses A & B were tested according to the time (in sec) to run a particular track with the following results.
Horse A 28 30 32 33 33 29 34
Horse B 29 30 30 24 27 29 -
Test whether the horse have the same running capacity
- Find the maximum difference that we can expect with probability 0.95 between the means of samples of sizes 10 and 12 from a normal population . If their SD are found to be 2 and 3 respectively.
- Measuring specimens of nylon yarn , take from two mechanic it found that 8 specimens from first machine had a mean denier of 9.67 with a SD of 1.81 while 10 specimens from second machine of 7.43. with a SD of 1.48. Assuming that the proportions are normal, test the hypothesis $H_0:\mu_1-\mu_2=1.5$ against $H_1: \mu_1-\mu_2>1.5$ at 0.05 level of significant?
- Ten workers were given a training programmer with a view to study their assemble time for a certain mechanism. The result of the time and motion studies before and after the programmer are give below.
Works 1 2 3 4 5 6 7 8 9 10
X1 15 18 20 17 16 14 21 19 13 22
Y1 14 16 21 10 15 18 17 16 14 20
X1=Time taken for assembling before training.
Y1=Time taken for assembling after training Test whether there is significant difference in assembly time before and after training.
- A pair of dice are thrown 360 times and the frequency of each sum is indicate below;
Sum: 2 3 4 5 6 7 8 9 10 11 12
Frequency 8 24 35 37 44 65 51 42 26 14 14
Would you say that the dice are fair on the basis of the chi-square test at .005 level of significant?
- Four method are under development for making discs of a superconducting material. Fifty discs are made by each method and they are checked for superconductivity when cooled with liquid.
1st Method 2nd Method 3rd method 4th Method
Super conductors 31 42 22 25
Failures 19 08 28 25 Test the significant difference b/w the proportion of super conductors at 0.05 level?
- A firm manufacturing rivets wants to limit variations in their length as much as possible. The length (in cm) of 10 rivets manufactured by a new process are 2.15 1.99 2.05 2.12 2.17 2.01 1.98 2.03 2.25

1.9 Examine whether the new process can be consider superior to the old if the old population has S D is 0.145 cm?

UNIT- VI

1. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

2. Find Karl Pearson's coefficient of correlation from the following data

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

3. Calculate Karl Pearson's correlation coefficient for the following paired data.

X	28	41	40	38	35	33	40	32	36	33
Y	23	34	33	34	30	26	28	31	36	38

What inference would you draw from the estimate.

4. a) Calculate coefficient of correlation between the marks obtained by a batch of 100 students in accountancy and Statistics as given bellow.

Age of Husbands	Age of Wives						Total
	15-25	25-35	35-45	45-55	55-65	65-75	
15-25	1	1	-	-	-	-	2
25-35	2	12	1	-	-	-	15
35-45	-	4	10	1	-	-	15
45-55	-	-	3	6	1	-	10
55-65	-	-	-	2	4	2	8
65-75	-	-	-	-	1	2	3
Total	3	17	14	9	6	4	53

b) Properties of rank correlation coefficients?

5. A Random sample of 5 college students is selected and their grades in mathematics and Statistics are found to be

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

Calculate Pearlman's rank correlation coefficient?

6. From the following the data Calculate the rank correlation coefficient after making adjustment for tied ranks.

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	16	19

7. Define Karl person's coefficient of correlation with properties?

8. Two independent Variables are uncorrelated?

9. Define Regression with related properties?

10. Regression equation of two variables X and Y are as follows $3x+2y-26=0$, $6x+y-31=0$.

UNIT- VII

1. A manager of a local hamburger restaurant is preparing to open a new fast food restaurant called Hasty Burgers. Based on the arrival rates at existing outlasts. Manager expects customers to arrive at the drive in window according to a Poisson distribution, with a mean of 20 customers per hour. The service rate is flexible, however, the service times are expected to follow an exponential distribution. The drive in window is single ever operation.
- a) What service rate is needed to keep the average number of customers in the service system to 4
 (b) For the service rate in part (a), what is he probability that more than 4 customers are in the line and being served?
2. At a certain petrol pump, customers arrive in a Poisson process with an average time of five minutes between arrivals. The time intervals between serves at the petrol pump follows exponential distribution and the mean time taken to service a unit is two minutes. Find the following :
- (a) Average time a customer has to wait in the queue
 (b) By how much time the flow of the customers be increases to justify the opening of another service point, where the customer has to wait for five minutes for the service.

3. A fast-food restaurant has one drive-in window. It is estimated that cars arrive according to a Poisson distribution at the rate of 2 every 5 minutes and that there is enough space to accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 1.5 minutes on the average to fill an order, but the service time actually varies according to an exponential distribution. Determine the following.
 - (a) The probability that the facility is idle
 - (b) The expected number of customers waiting to be served.
4. (a) Explain about queuing theory characteristics?
 (b) Define preemptive discipline and non preemptive priority?
5. Barber A takes 15 minutes to complete one hair cut. Customers arrive in his shop at an average rate of one every 30 minutes. Barber B takes 25 minutes to complete one hair cut and customers arrive at his shop at an average rate of one every 50 minutes. The arrival process is Poisson and the service times follow an exponential distribution.
 - a) Where would you expect a bigger queue
 - b) Where would you require more time waiting included to complete a hair cut.

UNIT-VIII

1. Define Stochastic processes, Types of stochastic processes?
2. Define Markov chains? Write related properties?
3. Let $M_n = (X_1 + X_2 + X_3 + \dots + X_n)/n$ is M_n a Markov process?
4. An urn initially contains five black balls and five white balls. The following experiment is repeated indefinitely. A ball is drawn from the urn; if the ball is white it is put back in the urn, otherwise it is left out. Let X_n be the number of balls remaining in the urn after n draws from the urn.?
5. The diffusion of electrons and holes across a potential barrier in an electronic device is modeled as follows; There are m black balls (electrons) in urn A and m white balls (holes) in urn B. We perform independent trials, in each of which a ball is selected at random from each urn and the selected ball from urn A is placed in urn B, while that from urn B is placed in A. Consider the Markov chain representing the number of black balls in urn A immediately after the n -th trial.
 - a) Describe the one-step transition probabilities of the process.
 - b) Suppose $m=3$. Compute the one-step transition probability matrix.