1. Write a note on role of the mathematical applications in managerial functions with examples.

2. Explain the significance, scope and limitations of statistics.

3. There are categories of employees from bottom to top named as E_1, E_2, E_3...E_7. The employees are given bonus in increasing order from bottom to top which form a geometric series. If the bonus given to E_3 is 81 and E_7 is 6561, find the bonus given to E_1.

4. A man plans to return a loan of Rs. 3600/- to a bank in 40 arithmetic instalments. As he pays off two third of the loan in 30 instalments, the bank waives him from paying the rest of his instalments under a specific scheme. Find the amount of first instalment paid by him.

5. Using Cramer's method find the value of X_1, X_2 and X_3

$$X_1 + X_2 + 4X_3 = 36$$
$$2X_1 + X_2 + X_3 = 18$$
$$X_1 + 2X_2 + X_3 = 20$$

6. Write a detailed note on different types of matrices with illustrations.

7. Explain the compatibility of Inverse of Matrix. Find the inverse of the following matrix:

$$\begin{bmatrix} 5 & 7 & 3 \\ 4 & 5 & 6 \\ 7 & 5 & 9 \end{bmatrix}$$

8. Write short notes with examples on:

   - Surds
   - Indices

9. Answer to the following questions

   (i). Define dispersion.
   (ii). What is the coefficient of dispersion?
   (iii). Define range.
   (iv). What is the quartile deviation?
   (v). What is the coefficient of quartile deviation formula?
   (vi). Define mean deviation.
   (vii). What is standard deviation?
   (viii). What is a Lorenz curve?
   (ix). Define variance.

10. What is the scope and importance of Statistics? Explain the merits and demerits of median.

11. What is the purpose of average is the statistical method? What are the different kinds of statistical average?

12. The 20 meetings of a square dance club were attended by 26, 25, 28, 23, 25, 24, 24, 23, 26, 26, 28, 26, 24, 32, 25, 27, 24, 23, 24, and 22 of its members. Find the mode, median, and mean.

13. If the mean annual salary paid to the top of three executives of a firm is $96, 000, can one of them receive an annual salary of $300, 000?

14. An instructor counts the final examination in a course four times as much as of the four one-hour examinations. What is the average grade of a student who received grades of 74, 80, 61, and 77 in the four one- hour examinations and 83 in the final examination?

15. Find Mean and Median of given distribution:

Class	Less than 100	Less than 80	Less than 60	Less than 40	Less than 20
Frequency	20	17	12	5	2

16. In 1980 a college paid its 52 instructors a mean salary of $13, 200, its 96 assistant professors a mean salary of $15, 800, its 67 associate professors a mean salary of $18, 900, and its 35 full professors a mean salary of $23, 500. What was the mean salary paid to all the teaching staff of this college?

17. Find Mean, Median and Mode of the following Data:

Marks	No. of Students
Less than 10	2
Less than 20	7
Less than 30	17
Less than 40	29
Less than 50	46
Less than 60	50

18. The average age of 15 students of a class is 15 years. Out of them, the average age of 5 students is 14 years and that of the other 9 students is 16 years. What is the age of the 15th students?

19. A gardener buys 10 packets of seeds from two different companies. Each pack contains 20 seeds and he records the number of plants which grow from each pack.

Company A	20	5	20	20	20	6	20	20	20	8
Company B	17	18	15	16	18	18	17	15	17	18

- o (a) Find the mean, median and mode for each company's seeds.
- o (b) Which company does the mode suggest is best?
- o (c) Which company does the mean suggest is best?
- o (d) Find the range for each company's seeds.

20. Consider the following data:

16, 18, 18, 22, 22, 23, 23, 24, 26, 29, 32, 34, 34, 36, 36, 42, 43, 46, 46, 49, 57

   (i).   Compute the median.
   (ii).   Compute the lower quartile.
   (iii). Compute the upper quartile.
   (iv).   Compute the interquartile range.

21. A data entry operator enters the age of 100 employees and finds mean to be 40 years with a standard deviation of 10 years. Further it is observed that he entered a data wrongly as 14 years instead of 41 years. Find the correct mean and standard deviation.

22. Below is the table showing the values of the results for two companies A, and B.

	Company A	Company B
Number of employees	900	1000
Average daily wage	Rs. 250	Rs. 220
Variance of the distribution of wages	100	144

   (i).   Which of the company has a larger wage bill?
   (ii). Calculate the coefficients of variations for both of the companies.

(iii). Calculate the average daily wage and the variance of the distribution of wages of all the employees in the firms A and B taken together.

23. Explain the following:

  (i) Mutually Exclusive Cases
  (ii) Simultaneous Cases
  (iii) Sample Space
  (iv) Exhaustive Cases
  (v) Independent and Dependent Events

24. In a class, there are 12 boys and 16 girls. One of them is called out by an enroll number, what is the probability that the one called is a girl?

25. A box contains 3 white, 4 red and 7 blue erasers. If five erasers are taken at random then the probability that all the five are blue color is:

26. A box contains 6 bottles of variety1 drink, 3 bottles of variety2 drink and 4 bottles of variety3 drink. Three bottles of them are drawn at random, what is the probability that the three are not of the same variety?

27. There are 12 boys and 8 girls in a tution centre. If three of them scored first mark, then what is the probability that one of the three is a girl and the other two are boys?

28. A box contains 21 balls numbered 1 to 21. A ball is drawn and then another ball is drawn without replacement. What is the probability that both balls are even numbered?

29. There are 3 green, 4 orange and 5 white color bulbs in a bag. If a bulb is picked at random, what is the probability of having either a green or a white bulb?

30. A box contains slips with numbers from 1 to 50 written on them. A slip is drawn and replaced. Then another slip is drawn and after replacing another slip is drawn. What is the probability that an even number appears on the first draw, an odd number on the second draw and a number divisible by 3 on the third draw?

31. When 4 fair coins are tossed together what is the probability of getting at least 3 heads?

32. A committee of 3 members is to be made out of 6 men and 5 women. What is the probability that the committee has at least two women?

33. The names of 5 students from section A, 6 students from section B and 7 students from section C were selected. The age of all the 18 students was different. Again, one name was selected

from them and it was found that it was of section B. What was the probability that it was the youngest student of the section B?

34. A bag contains 35 balls of three different colors viz. red, orange and pink. The ratio of red balls to orange balls is 3 : 2, respectively and probability of choosing a pink ball is 3/7. If two balls are picked from the bag, then what is the probability that one ball is orange and one ball is pink?

35. Aarti gave her project assignment to a shopkeeper for binding. There were 19 pages including a cover page, 12 pages of theory and 6 pages of drawings. She told the shopkeeper that the theory pages are in a particular order and the drawing pages can be arranged anywhere provided they are together. If the cover page is always kept first what is the probability that rest of the pages are arranged as per requirement?

36. If the letters of the word "CRACKJACK" are rearranged in a random manner, what is the probability that vowels are neither together nor at the ends?

37. A basketball game is played between team Blue and Red. There are a total of 9 players in each team and 5 will play in the game. Ankit is in team blue and Vaibhav is in team Red. What is the probability that at least one of Ankit orVaibhav is in playing five?

38. Three identical dices are rolled together, what is the probability that the product of all three outcomes on the three dices will be even?

39. There is a team of 100 investigators which visited a city to test if the people take tea. Each member meets 10 people. If half of the population of the city takes tea, how many investigators will report that in their survey 3 or less people take tea?

40. A company produces electric bulbs with 5 items defective in a lot of 80 on an average. What is the probability that in a sample of 50 items, exactly 3 items will be defective?

41. There is a team of 100 soldiers whose average height is 175 cm on an average with a standard deviation of 7 cm. How many soldiers will be equal to or above 180 cm?

42. Explain the Central Limit Theorem with example.

43. Explain Type I and Type II Errors with example.

44. A company claims to produce screws of size 300 mm on an average with a standard deviation of 20 mm. A random sample of 81 items finds the mean 290 mm. Test the clam of the company at 5% level of significance.

45. A company claims to produce pens with a writing span of at least 700 pages with a standard deviation of 50 pages. A sample of 121 pages declares the mean to be 297 pages. Test the claim of the company.

46. The running span of the machines of a company is 400 minutes on an average with a standard deviation of 40 minutes. A new servicing technique is introduced to increase the running duration. A sample of 81 machines shows the mean 409 minutes on an average after the introduction of new servicing technique. Can it be considered that the new technique is affective?

47. A company produces metal bearings of size o.25 cm. A sample of 10 items finds the mean to be 0.24 cm with a standard deviation of 0.02 cm. Test if the sample has been taken from the company.

48. Consider the data as follows:

Year	2015	2016	2017	2018	2019
Price	11	19	27	78	99

(a) Find the base years index considering 2015 as base.

(b) Find the price relative index.

49. Find the tome series analysis through semi average and 3 yearly moving average for the following data:

Year	1	2	3	4	5	6	7	8
Price	77	89	99	107	111	121	125	140