



**2024/FYUG/EVEN/SEM/
STADSM-151T/067**

FYUG Even Semester Exam., 2024

STATISTICS

(2nd Semester)

Course No. : STADSM-151T

(Statistical Methods and Probability)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The Learning App

*The figures in the margin indicate full marks
for the questions*

SECTION—A

Answer any ten of the following questions :

2×10=20

- 1. Define the term 'statistics'. Mention some limitations of statistics.**
- 2. Define qualitative and quantitative data with examples.**
- 3. What are discrete and continuous data? Give examples.**



(2)

4. Define mode of a distribution. Write down the formula for mode for a continuous frequency distribution.
5. What do you mean by measures of dispersion? What are the different measures of dispersion?
6. What are raw moments and central moments of the r th order?
7. Write the properties of Karl Pearson's correlation coefficient.
8. If $b_{XY} > 1$, then $b_{YX} < 1$, prove it, when b_{XY} is the regression coefficient of X on Y and b_{YX} is the regression coefficient of Y on X .
9. Mention two properties of regression coefficients.
10. Define a random experiment. Give an example.
11. Define the terms 'trial' and 'event'.

(3)

12. Give the axiomatic definition of probability.
13. State the addition theorem of probability.
14. If A and B are two independent events and $P(A \cap B) = .25$ and $P(A) = .5$, then what is $P(B)$?
15. If A and B are two mutually exclusive events, then $P(A \cup B) = ?$

SECTION—B

Answer any five of the following questions : $10 \times 5 = 50$

16. (a) What are the different types of data used in statistics? Define them and cite examples of each. 2+2+1=5
- (b) Write a note on graphical representation of statistical data. 5
17. (a) Represent the following data with the help of a histogram : 5

Marks	15-19	20-24	25-29	30-34	35-39
No. of Students	9	11	10	44	45

Marks	40-44	45-49	50-54	55-59	60-64
No. of Students	54	37	26	8	5



(4)

- (b) What are 'less than' and 'more than' cumulative frequency curves? Describe their construction.

5

18. (a) What are the different measures of central tendency? Write down the requisites of a good measure of central tendency of the different measures of central tendency. Which are amenable for further mathematical treatment?

2+2+1=5

- (b) Obtain the relationship between the r th raw and the r th central moments. Hence, find μ_2 in terms of μ'_2 and μ'_1 .

4+1=5

19. (a) Define range, quartile deviation, mean deviation, standard deviation and variance.

1+1+1+1+1=5

- (b) Define skewness and kurtosis. Also give the formula for measuring skewness and kurtosis.

3+2=5

20. (a) What is a scatter diagram? How can you have an idea about correlation from scatter diagram?

2+3=5

(5)

- (b) Define Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient. Obtain the range of Karl Pearson's correlation coefficient.

1+1+3=5

21. (a) Obtain the equation of the line of regression of X on Y and Y on X .

2½+2½=5

- (b) Explain how the principle of least squares is used in fitting a straight line of the form $y = a + bx$ to a set of data (x_i, y_i) $i = 1, 2, \dots, n$.

5

22. (a) Define the terms 'exhaustive events', 'favourable events', 'mutually exclusive events', 'equally likely events' and 'independent events'.

1+1+1+1+1=5

- (b) If A, B and C are any three events, write down the theoretical expressions for the following events :

1+1+1+1+1=5

(i) Only A occurs(ii) A, B and C all the three occur

(iii) At least two occur

(iv) A and B occur but C does not occur

(v) None occurs



23. (a) Give the classical definition of probability. Show that the probability of an event takes values from $[0, 1]$. Also give two limitations of the classical definition of probability. $2+1+2=5$

(b) Give the empirical definition of probability citing its limitations. Find the probability of drawing (i) a white ball and (ii) a red ball from a bag containing 6 red balls, 8 black balls, 10 yellow balls and 1 green ball.

$$2+1+2=5$$

24. (a) State and prove the addition theorem of probability. The probability that a student passes an English test is $\frac{2}{3}$ and probability that he passes both English and Physics test is $\frac{14}{45}$. The probability that he passes at least one test is $\frac{4}{5}$. What is the probability that he passes the Physics test?

$$2\frac{1}{2}+2\frac{1}{2}=5$$

(b) State and prove the multiplication theorem of probability. If two events are independent, then what is the probability of their intersection? $3+2=5$

25. (a) State Bayes' theorem. The probability of X , Y and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The probabilities that Bonus Scheme will be introduced if X , Y , Z becomes managers are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively. What is the probability that if Bonus Scheme was introduced, then X was appointed as manager?

$$2+3=5$$

- (b) Define pairwise and mutually independent events. Prove that if A , B and C are mutually independent events, then $(A \cup B)$ and C are also mutually independent. $1\frac{1}{2}+1\frac{1}{2}+2=5$
