2023/FYUG/ODD/SEM/
STADSM-101T/075

FYUG Odd Semester Exam., 2023
(Held in 2024)

STATISTICS

(1st Semester)

Course No. : STADSM-101T

(Basic Statistics and Probability)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer *ten* questions, selecting any *two* from each Unit : $2 \times 10 = 20$

UNIT—I

1. Define population and sample.

2. What are nominal data and time series data?

3. What are the information required to draw a histogram and frequency polygon?

UNIT—II

4. Define measures of central tendency. What are the types of measures of central tendency?

5. If $x_i | f_i$, $i = 1, 2, \ldots, n$ be any frequency distribution, then prove that

$$\sum_{i=1}^{n} f_i (x_i - \bar{x}) = 0$$

6. Define positive and negative skewness.

UNIT—III

7. Define positive and negative correlation.

8. Interpret the meaning of the statement $b_{yx} = -0 \cdot 53$, where b_{yx} is the regression coefficient at y on x.

9. State some properties of regression coefficients.

UNIT—IV

10. Define random experiment and trial.

11. Give the axiomatic definition of probability.

12. If $A \subseteq B$, then show that $P(A) \leq P(B)$.

UNIT—V

13. Under what condition—

(i) $P(A \cup B) = P(A) + P(B)$;

(ii) $P(A|B) = P(A)$?

14. If

$$P(A) = \frac{1}{2},\ P(B) = \frac{1}{3} \text{ and } P(A/B) = \frac{1}{2}$$

then find $P(A \cup B)$ and $P(A \cap B)$.

15. State Bayes' theorem of probability.

SECTION—B

Answer *five* questions, selecting *one* from each Unit : 10×5=50

UNIT—I

16. (a) Define statistics in singular sense and plural sense. State some scopes and limitations of statistics. 1+2+2=5

(b) Write a note on drawing the cumulative frequency curve of less than type and more than type from a given data. 2½×2=5

17. (a) Define tabulation. Explain the important parts of a good statistical table. 2+4=6

(b) In a sample study about the coffee habits in two towns, the following data were observed :

Town A : 55% people were males

40% were coffee drinkers

28% were male coffee drinkers

Town B : 65% people were males

45% were coffee drinkers

35% were male coffee drinkers

Tabulate the above observations. 4

UNIT—II

18. (a) Define arithmetic mean and harmonic mean. 1½×2=3

(b) Prove that arithmetic mean is not independent of change of origin and scale. 3

(c) Define geometric mean. If G_1 be the geometric mean of n_1 observations and G_2 be the geometric mean of n_2 observations, then prove that

$$\log G = \frac{n_1 \log G_1 + n_2 \log G_2}{n_1 + n_2}$$

where G is the geometric mean of $(n_1 + n_2)$ observations. 1+3=4

19\. *(a)* Define mean deviation. State the merits and demerits of mean deviation. 1+3=4

(b) Prove that standard deviation is not less than mean deviation about mean. 3

(c) Write a note on kurtosis. 3

UNIT—III

20\. *(a)* Define Karl Pearson's correlation coefficient. Prove that correlation coefficient is independent of change of origin and scale. 2+3=5

(b) Prove that correlation coefficient lies between −1 and 1. Also define Spearman rank correlation coefficient. 4+1=5

21\. *(a)* Define regression coefficients. Why are there two lines of regression? Explain. 2+3=5

(b) If one of the regression coefficients is greater than 1, then the other is less than 1. Prove it. 2

(c) Explain the filling of a straight line using the principle of least squares. 3

UNIT—IV

22. *(a)* Define independent events and mutually exclusive events. 2+2=4

(b) If A and B are independent events, then prove that A^e and B are also independent events. 3

(c) Find the probability that a leap year selected at random will contain 53 Sundays. 3

23. *(a)* Give the classical definition of probability. State the limitation of classical definition of probability. 2+2=4

(b) An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that—

two of the balls drawn are white;

one is of each colour;

none is red;

at least one is white. 4

(c) Define sample space and sample point. 2

UNIT—V

24. *(a)* If A and B are two events such that $P(A) = 0 \cdot 4$, $P(A \cup B) = 0 \cdot 7$ and $P(B) = p$, for what value of p, the events A and B are—

mutually exclusive events;

independent events? 2+2=4

(b) If A and B are two events, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. 4

(c) State compound theorem of probability. 2

25. (a) For two events A and B, prove that

$$P(A \cap B) \le P(A) \le P(A \cup B) \le P(A) + P(B)$$ 4

(b) If A, B and C are mutually exclusive and exhaustive events and $P(A) = \frac{1}{2} P(B)$ and $P(B) = \frac{2}{3} P(C)$, then find $P(A)$, $P(B)$ and $P(C)$. 3

(c) A number is chosen from each of the two sets :

1, 2, 3, 4, 5, 6, 7, 8, 9

1, 2, 3, 4, 5, 6, 7, 8, 9

If P_1 denotes the probability that the sum of the two numbers be 10 and P_2 be the probability that the sum be 8, then find $P_1 + P_2$. 3

★ ★ ★