2023/FYUG/ODD/SEM/
STADSC–101T/073

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

STATISTICS

(1st Semester)

Course No. : STADSC–101T

(Descriptive 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 *two* from each Unit : 2×10=20

UNIT—I

1. Differentiate between qualitative and quantitative data.

2. Define a population and a sample. Give examples of finite and infinite populations.

3. Explain the terms 'primary data' and 'secondary data' with examples.

UNIT—II

4. What are the requisites of a good measure of central tendency?

5. What is the effect of change of origin and scale on the arithmetic mean, median and mode?

6. Which measure is used to compare the consistency of two or more sets of data? Write down its formula.

UNIT—III

7. Given that $(AB) = 150$, $(A\beta) = 230$, $(\alpha B) = 260$ and $(\alpha\beta) = 2340$. Find the other frequencies and the value of N. Symbols hold their usual meanings.

8. Indicate the correct answer : $\frac{1}{2}\times 4=2$

(a) For two attributes A and B, the ultimate class frequencies are

(i) (A)
(ii) (AB)
(iii) (α)
(iv) (B)

(b) The condition for the consistency of a set of independent class frequencies is that no ultimate class frequency is

(i) 0
(ii) positive
(iii) negative

(c) The attributes A and B are said to be independent, if

(i) $(AB) > \frac{(A)\times(B)}{N}$

(ii) $(AB) = \frac{(A)\times(B)}{N}$

(iii) $(AB) < \frac{(A)\times(B)}{N}$

(d) What is the value of Q for perfect positive correlation?

(i) 0

(ii) $-0\cdot9$

(iii) -1

(iv) $+1$

9. What do you mean by independence of attributes?

UNIT—IV

10. Define scatter diagram. Draw the scatter diagram for $(r>0)$; $r<0$.

11. Is the correlation coefficient affected by change of origin and scale? What are the limits of the correlation coefficient?

12. What are the assumptions underlying Karl Pearson's correlation coefficient?

UNIT—V

13. Define random experiment, mutually exclusive events, exhaustive events and equally likely events.

14. Give the mathematical definition of probability. What are its limitations?

15. Give the axiomatic definition of probability.

SECTION—B

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

UNIT—I

16. *(a)* Define 'classification' and 'tabulation' of data. Draw a blank table to show the distribution of population in the eight northeastern States of India in 2021 according to age, sex and literacy rates. 2+3=5

(b) Briefly discuss the scope and limitations of statistics. 5

17. *(a)* What are the different scales of measurement? Discuss them with examples. 1+4=5

(b) Explain how frequency polygon and frequency curve can be drawn for any frequency distribution. 5

(Continued)

UNIT—II

18. *(a)* *(i)* Show that the sum of squares of deviations of a set of values is minimum when taken about the mean.

(ii) Show that the algebraic sum of deviations of observations from their arithmetic mean is equal to zero. 2½+2½=5

(b) Derive the formula for the median for a continuous distribution. 5

19. *(a)* Prove that for any discrete distribution, standard deviation is not less than mean deviation from the mean. 5

(b) Show that in a discrete series, if deviations are small compared with the mean M so that $(x/M)^3$ and higher powers are neglected

$$G = M\left(1 - \frac{1}{2}\frac{\sigma^2}{M^2}\right)$$

where G = geometric mean

σ^2 = variance

M = arithmetic mean 5

UNIT—III

20. *(a)* Find if A and B are independent, positively associated or negatively associated, in each of the following cases : 1½+1½+2=5

(i) $N = 1000$, $(A) = 470$, $(B) = 620$ and $(AB) = 320$

(ii) $(A) = 490$, $(AB) = 294$, $(\alpha) = 570$ and $(\alpha B) = 380$

(iii) $(AB) = 256$, $(\alpha B) = 768$, $(A\beta) = 48$ and $(\alpha\beta) = 144$

(b) For the following table, give Yule's coefficient of association (Q) and coefficient of colligation (Y). Examine the cases : 5

(i) $bc = 0$

(ii) $ad = 0$

(iii) $ad = bc$

	B	not B
A	a	b
not A	c	d

21. *(a)* What is the principle of least squares? Describe the fitting of the straight line $y = a + bx$ to a set of data (x_i, y_i), $i = 1, 2, \ldots, n$. 5

(b) Describe the fitting of the exponential curve $y = ab^x$ to a set of data (x_i, y_i), $i = 1, 2, \ldots, n$. 5

UNIT—IV

22. *(a)* *(i)* Find the limits of Karl Pearson's correlation coefficient.

(ii) If $u = \frac{x-a}{h}$ and $v = \frac{y-b}{k}$, derive the relationship between r_{xy} and r_{uv}.

2½+2½=5

(b) Define rank correlation coefficient. Derive the formula for rank correlation coefficient. 5

23. *(a)* Define regression. What are the properties of regression coefficients? Derive the angle between the two lines of regression. 5

(b) Obtain the equations of line of regression of X on Y and Y on X.

2½+2½=5

UNIT—V

24. *(a)* State and prove the addition theorem of probability. 5

(b) State and prove the multiplication theorem of probability. 5

25. *(a)* State and prove Bayes' theorem. 5

(b) For any two events A and B, show that

$$P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$$ 5

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