C 33354 (Pages : 3) Name.....................................

Reg. No.................................

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

STS 1C 01—BASIC STATISTICS AND PROBABILITY

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions in* **one word**.
Each question carries 1 mark.

Fill up the blanks :

1. Two sets of observations with number of elements 10 and 15 respectively, the means are 5 and 10. The mean of these 25 observations taken together is ———.
2. Harmonic mean of 10 and 15 is ———.
3. If $r_{xy} = 0$, the angle between the regression lines is ———.
4. For two events A and B, $P(A \cup B) = 0.6 = 2P(A \cap B)$; then, $P(A) + P(B) =$ ———.
5. If A and B are mutually exclusive, $P(A/B) =$ ———.

Write True *or* False :

6. Mode is a positional average.
7. If A and B are exhaustive, $P(A \cup B) = 1$.
8. Rank correlation coefficient is used in case of qualitative variables.
9. It is possible to find range for data given in grouped frequency table with open ended classes.
10. Both the regression coefficients are always having the same sign.

(10 × 1 = 10 marks)

Section B

Answer **all** *questions in* **one sentence** *each.*
Each one carries 2 marks.

11. Define central tendency.
12. Define geometric mean.
13. Obtain the standard deviation of first n natural numbers.
14. Define partition of sample space.

Turn over

15. Define probability space.

16. For two events A and B, $P(A) = 1/3, P(B) = 1/4, P(A \cup B) = 1/3$. Find $P(B/A)$.

17. Two fair dice are thrown. Find the probability that the sum of the numbers shown is more than 10.

(7 × 2 = 14 marks)

Section C

Answer any **three** *questions.*
Each one carries 4 *marks.*

18. The mean and standard deviation of a variable X are m and n respectively. Obtain the mean and standard deviation of Y, where $Y = aX + b$.

19. Given the regression lines $9x - 4y + 15 = 0$ and $25x - 6y - 7 = 0$. Find the means of the variables.

20. For two events A and B, $P(A) = 0.3, P(B) = p, P(A \cup B) = 0.8$. Find p if A and B are independent.

21. Define probability mass function and state its properties.

22. Find k, if $f(x) = k\left(\frac{2}{3}\right)^x, x = 1, 2, ...$ is a probability mass function.

(3 × 4 = 12 marks)

Section D

Answer any **four** *questions.*
Each one carries 6 *marks.*

23. Obtain the mean deviation about mean for the following data :

Class	:	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	:	6	5	8	15	7	6	3

24. Using principle of least squares, explain the fitting of the curve of the form $y = ab^x$.

25. Derive Spearman's rank correlation coefficient.

26. For any *two* events A and B, prove that :

(i) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

(ii) $P\left[\left(A \cap B^c\right) \cup \left(A^c \cap B\right)\right] = P(A) + P(B) - 2P(A \cap B)$.

27. Given the p.d.f. of a random variable X, $f(x) = \begin{cases} kx, & \text{for } 0 < x < 1 \\ k, & \text{for } 1 < x < 2 \\ -kx + 3k, & \text{for } 2 < x < 3 \\ 0, & \text{elsewhere} \end{cases}$. Find (i) k ; (ii) $F(x)$.

28. Given $f(x) = \begin{cases} e^{-x}, x > 0 \\ 0, \text{otherwise} \end{cases}$ as the p.d.f. of X. Obtain the p.d.f. of $Y = e^{-x}$.

(4 × 6 = 24 marks)

Section E

Answer any **two** *questions.*
Each one carries 10 *marks.*

29. Define coefficient of variation. 2 cities shows the following prices for a particular commodity recorded over 5 weeks.

City A	:	20	22	19	22	23
City B	:	18	12	10	20	15

Compare the consistency in the prices for these two cities.

30. (i) Write a note on correlation.

(ii) Show that Pearson's coefficient of correlationr r_{xy}, is independent of linear transformation.

31. (i) Define conditional probability.

(ii) State and prove Bayes' theorem.

32. Given the distribution function of X as,

$$F(x) = \begin{cases} 0, \text{ for } x < 0 \\ \frac{x^2}{2}, \text{ for } 0 \le x < 1 \\ \frac{1}{2} + k(4x - x^3 - 3), \textit{ for } 1 \le x < 2 \\ 1, \text{ for } x \ge 2 \end{cases}$$

(i) Obtain the p.d.f. of X.

(ii) Find k.

(iii) A and B are events denoting $\left(\frac{1}{2} < X < \frac{3}{2}\right)$ and $(X > 1)$ respectively. Verify whether A and B are independent.

(2 × 10 = 20 marks)