

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Complementary Course

STS 1C 01—BASIC STATISTICS AND PROBABILITY

Time : Three Hours

Maximum : 80 Marks

Section A

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

Fill up the blanks :

- 1 Sum of squares of deviations of the observations is minimum when it is taken about their _____.
- 2 Standard deviation of x_1, x_2, \dots, x_n is k . Then the standard deviation of the set $x_1 + a, x_2 + a, \dots, x_n + a$, where a is a constant is _____.
- 3 For two non negative observations x_1, x_2 , A.M. X H.M. = _____.
- 4 For two mutually exclusive events A and B, $P(A \cup B) =$ _____.
- 5 Geometric mean of regression coefficients gives the absolute value of _____.

Write true or false :

- 6 Average speed is calculated using harmonic mean.
- 7 If A and B are independent, $P(A \cap B) = P(A) + P(B)$.
- 8 Pearson's coefficient of correlation between two variables X and Y is $\frac{\text{Cov}(X, Y)}{\sqrt{V(X)}\sqrt{V(Y)}}$.
- 9 Geometric mean is one of the measures of central tendency.
- 10 The point of intersection of regression lines gives the means of the variables.
(10 × 1 = 10 marks)

Section B

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

- 11 Define mutually exclusive events.
- 12 Three coins each with the sides denoted by H and T are tossed. What is the sample space ?
- 13 A card is drawn from a deck of 52 cards. What is the probability that the card drawn is an ace or a spade ?

Turn over

- 14 Define a random variable.
- 15 State the multiplication theorem on probability for three events A, B and C.
- 16 Distinguish between population and sample.
- 17 Define dispersion.

(7 × 2 = 14 marks)

Section C

Answer any three questions.

Each one carries 4 marks.

- 18 In a group of n the mean age of men and women is 30 years. If the mean age of x men is 32 and $(n - x)$ women is 27, find the percentage of men in the group.
- 19 Given the regression lines $14x + 12y - 3 = 0$ and $12x + 21y + 10 = 0$. Identify the regression lines.
- 20 For an event A, using frequency definition prove that, $0 \leq P(A) \leq 1$.
- 21 Define probability density function and state its properties.
- 22 A and B are independent events in the sample space S. Show that (i) A^C and B ; (ii) A^C and B^C are also independent.

(3 × 4 = 12 marks)

Section D

Answer any four questions.

Each one carries 6 marks.

- 23 Define partition values. Describe important partition values and their inter relations.
- 24 Using principle of least squares, explain the fitting of straight line connecting the variables X and Y.
- 25 Derive spearman's rank correlation coefficient.
- 26 A, B and C toss a coin in succession on the rule that the first one to throw a head wins. What are the probabilities of winning of A, B and C ?

- 27 Given the p.d.f. of a non-negative random variable $f(x) = \frac{1}{5} e^{-\frac{1}{5}x}$, $x > 0$, prove that $P(X > 5 / X > 2) = P(X > 3)$.

- 28 Given $f(x) = \begin{cases} 1 & , 0 < x < 1 \\ 0 & , \text{ otherwise} \end{cases}$ as the p.d.f. of X. Obtain the p.d.f. of $Y = -2 \log_e X$.

(4 × 6 = 24 marks)

Section E

Answer any two questions.

Each one carries 10 marks.

- 29 Define coefficient of variation. Among the following two series of observations, identify which series is more consistent.

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|----------|---|------|-------|-------|-------|-------|-------|-------|
| Class | : | 0—10 | 10—20 | 20—30 | 30—40 | 40—50 | 50—60 | 60—70 |
| Series A | : | 1 | 2 | 9 | 8 | 5 | 4 | 1 |
| Series B | : | 1 | 3 | 7 | 8 | 7 | 3 | 1 |

- 30 Show that $-1 \leq r_{xy} \leq 1$, where r_{xy} is Pearson's coefficient of correlation.
- 31 State Bayes' theorem. 0.5% of the population of a city is suffering from a particular disease. A person suffering from this disease has 95% chances to be tested as positive. The chance for a wrong positive test result is 1%. What is the chance for a person actually to have the disease, if that person is tested positive?
- 32 A fair coin is tossed three times. (i) Obtain the probability distribution of the total number of heads (X) obtained (ii) Distribution function $F(x)$ of X (iii) Sketch the graph of $F(x)$ and (iv) Find $P(X > 2)$.

(2 × 10 = 20 marks)