Name: ....

Reg. No: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CUCBCSS-UG)

CC15U ST1 C01 - BASIC STATISTICS AND PROBABILITY

(Complementary)

(2015 to 2018 Admissions - Supplementary)

Time: Three Hours   Maximum: 80 Marks

Section A

Answer **all** questions. Each question carries 1 mark.

1. The relation between A.M., G.M. and H.M. is $\cdots\cdots\cdots$

2. Best measure of dispersion is $\cdots\cdots\cdots$

3. The idea of frequency definition of probability is given by $\cdots\cdots\cdots$

4. If $B \subset A$, the relation between $P(A)$ and $P(B)$ is $\cdots\cdots\cdots$

5. If A and B are independent events, then $P(A \mid B)$ is $\cdots\cdots\cdots$

Write true or false:

6. The algebraic sum of the deviations of a set of numbers from their mean is one.

7. Second quartile and fifth decile are equal.

8. $r = 0$ indicates that there is no linear relationship between the variables.

9. $P(A'B) = P(A) - P(AB)$.

10. An event whose occurrence is inevitable is called an impossible.

(10 × 1 = 10 Marks)

Section B

Answer **all** questions. Each question carries 2 marks.

11. Define geometric mean

12. What is coefficient of variation.

13. Define sample space of a random experiment and write down the sample space when a coin is tossed thrice.

14. Define conditional probability.

15. State the axiomatic definition of probability.

16. Define a random variable.

17. State the properties of probability distribution functions?

(7 × 2 = 14 Marks)

Section C
Answer any *three* questions. Each question carries 4 marks.

18. Prove that the sum of squares of the deviations of a set of numbers from their mean is the least.

19. Find the variance of the first n natural numbers.

20. State and prove the multiplication theorem of probability.

21. For the p.m.f. $P(X = x) = c(\frac{1}{2})^x$, $x = 0, 1, 2, \ldots$ find c, $P(X > 3)$

22. If P(A)=0.4, P(B)=0.3, P(AB)= 0.2 find the probability of :
    (i) at least one of the events occurs.
    (ii) exactly one of the events occurs.

(3 × 4 = 12 Marks)

Section D
Answer any *four* questions. Each question carries 6 marks.

23. Define mean deviation about mean. Show that standard deviation is not less than mean deviation about mean, for any discrete distribution.

24. Explain the principle of least squares. Describe how an exponential curve of the form $y = ab^x$ can be fitted.

25. The two regression lines are $3x + 12y - 10 = 0$ and $3y + 9x - 46 = 0$. Find (a) the means of X and Y, (b) the correlation coefficient.

26. Show that the correlation coefficient always lies between -1 and +1.

27. Prove or disprove: Pairwise independence does not imply Mutual independence.

28. Let X be a continuous random variable with probability density function
    $$f(x) = \begin{cases} \frac{x^2}{9}, & 0 \le x < 3 \\ 0, & \text{elsewhere.} \end{cases}$$
    Find the pdf of $Y = X^2$.

(4 × 6 = 24 Marks)

Section E
Answer any *two* questions. Each question carries 10 marks.

29. The scores of two teams in a match are given below. Find which team is more consistent in their play
    Team A : 32 38 39 47 48 50 62
    Team B : 31 34 48 40 48 53 55

30. Explain "rank correlation". Derive the formula for Spearman's rank correlation coefficient.

31. State and establish Baye's theorem for a countable number of events.

32. A random variable X has the following probability function

$$f(x) = \begin{cases} k, & \text{if } x = -1 \\ 2k, & \text{if } x = 0 \\ 3k, & \text{if } x = 1 \\ 0, & \text{Otherwise} \end{cases}$$

(a) Determine the value of k.

(b) Find $P(X < 0)$ and $P(X \geq 0.5)$.

(c) Write down the p.m.f of $Y = 2X + 3$.

$(2 \times 10 = 20 \textbf{ Marks})$

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