**20U136S** (Pages: 3) Name.....

Reg. No .....

**FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021**

(CUCBCSS- UG)

**CC15U ST1 C01 - BASIC STATISTICS AND PROBABILITY**

(Statistics - Complementary Course)

(2016 - 2018 Admissions - Supplementary)

Time: Three Hours Maximum: 80 Marks

## Section A

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

1. The correct relationship between A.M., G.M. and H.M is · · · · · · · · ·
2. Best measure of dispersion is · · · · · · · · ·
3. The idea of rank correlation was given by · · · · · · · · ·
4. If $A$ and $B$ are disjoint events, then $P(A \cap B)$ is · · · · · · · · ·
5. The probability of drawing any one spade cards from a pack of cards is · · · · · · · · ·

***Write true or false.***

6. Third quartile is median.
7. $r = 0$ indicates that there is no linear relationship between the variables.
8. The probability of all possible outcomes of a random experiment is always equal to one.
9. An event whose occurrence is inevitable is called an impossible.
10. If X is a random variable, then $P(X \leq x)$ is known as probability density function.

**(10 × 1 = 10 Marks)**

## Section B

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

11. List out the various measures of dispersion.
12. What is coefficient of variation.
13. Distinguish between mutually exclusive events and equally likely events
14. State the classical definition of probability.

15. Two unbiased dice are thrown. Find the probability that the product of the numbers coming up is 12.

16. Define random variable.

17. What are the properties of probability distribution functions?

**(7 × 2 = 14 Marks)**

## Section C

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

18. If P(A)=0.5, P(B)= 0.2, P(AB)=0.1 find the probability of:

    **(i)** At least one of the event occurs.

    **(ii)** Exactly one of the event occurs.

19. Find the mean and variance of the first $n$ natural numbers.

20. State and prove addition theorem of probability.

21. Let $A$ and $B$ be two events such that, $P(A \cup B) = 0.8$, $P(A) = 0.4$ and $P(A \cap B) = 0.3$, then $P(A \cap B^c)$

22. The random variable $X$ has the p.d.f:$f(x) = e^{-x}, o \leq x < \infty$. Find the p.d.f of the random variable $Y = 2X + 1$.

**(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. Prove that correlation coefficient is independent of change of origin and scale.

25. Obtain the rank correlation coefficient for the following data:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $x$ | : | 115 | 109 | 112 | 87 | 98 | 120 | 98 | 100 | 98 | 118 |
| $y$ | : | 75 | 73 | 85 | 70 | 76 | 82 | 65 | 73 | 68 | 80 |

26. 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.

27. Distinguish between probability density function and probability mass function.

28. A random variable $X$ has the following probability function

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

    **(a)** Determine the value of $k$.

    **(b)** Find $P(X < 2)$, $P(X \leq 2)$ and $P(0 < X < 2)$.

**(4 × 6 = 24 Marks)**



## Section E

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

29. **(a)** Find mean and median from the following data:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Marks | : | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| No.of students | : | 3 | 10 | 15 | 20 | 12 | 7 | 3 |

    **(b)** Following table gives the distribution of deaths from Scarlet fever classified according to age. Find the variance of this frequency distribution:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Age | : | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 |
| No.of deaths | : | 10 | 24 | 18 | 12 | 8 | 5 | 3 |

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

31. **(a)** State and prove Baye's theorem.

    **(b)** The probability that a doctor will diagnose a particular disease correctly is 0.6. The probability that a patient will die by his treatment after correct diagnosis is 0.4 and the probability of death by wrong diagnosis is 0.7. A patient of the doctor who had the disease died. What is the probability that his disease was not correctly diagnosed.

32. Let $X$ be a random variable with pdf:

$$f(x) = \begin{cases} ke^{-2x}, & 0 < x < \infty \\ 0, & \text{elsewhere.} \end{cases}$$

    (a) Find k.

    (b) Obtain the pdf of $Y = X^2$.

**(2 × 10 = 20 Marks)**

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