D1BHM2303 (S1) (PAGES: 3) **Reg. No.....**

Name: .....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(Improvement/Supplementary)

HONOURS IN MATHEMATICS

GMAH1B03T: PROBABILITY AND STATISTICS

Time: 3 Hours **Maximum Marks: 80**

Part A. Answer all the questions. Each question carries *one* mark.

Choose the correct answer.

1. Which of the following is not a measure of central tendency?

   a) Standard deviation. b) Mean. c) Median. d) Mode.

2. If the coefficient of kurtosis of a distribution is less than three, the frequency curve is:

   a) Leptokurtic. b) Platykurtic. c) Mesokurtic. d) None of these.

3. The square of coefficient of correlation is called _____.

   (a) Coefficient of regression. (b) Coefficient of determination.

   (c) Coefficient of non –determination. (d) None of these.

4. Every indecomposable outcome of a random experiment is called _____.

   (a) Sample point. (b) Sample space.

   (c) Probability. (d) None of these.

5. If it is known that an event B has occurred, the probability of an event A given B is called _____.

   (a) Empirical probability. (b) Conditional probability.

   (c) Inverse probability. (d) None of these.

Fill in the blanks.

6. The formula for inter quartile range is _____.
7. Karl Pearson's formula for measuring skewness is _____.
8. Regression equation of Y on X is _____.
9. If A and B are two mutually exclusive events, then P(AUB) = _____.
10. If $f(x)=\begin{cases}\frac{kx}{4}; x=1,2\end{cases}$

    then the value of k = _____.

(10 × 1 = 10 Marks)

(PTO)

Part B. Answer any *eight* questions. Each question carries *two* marks.

11. Write a note on any four characteristics of an ideal measure of central tendency.
12. Find the arithmetic mean of first n natural numbers.
13. Prove that for any discrete distribution, standard deviation is not less than mean deviation from mean.
14. What do you mean by positively skewed random variable?
15. Differentiate the terms Covariance and Correlation between any two random variables.
16. Calculate the correlation coefficient from the following information: Variance of X = 9 and the regression equations are: 8X - 16Y = 0 and 40X - 18Y = 214.
17. Elucidate the utilization of a scatter diagram in the context of regression analysis?
18. State and prove addition theorem for two events.
19. A student is to match 3 historical events (Mahatma Gandhi's Birthday, Indian freedom, First world war), with 3 years (1896,1947,1914). If he guesses with no knowledge of the correct answers, what is the probability distribution of the number of answers he guessed correctly?
20. A continuous random variable has a pdf,

$$f(x) = 3x^2 \; ; 0 < x < 1$$
$$= \; 0 \; ; \; elsewhere.$$

Find b such that $P\{X > b\} = 0.05$.

(8 × 2 =16 Marks)

Part C. Answer any *six* questions. Each question carries *four* marks.

21. Obtain the median for the following frequency distribution.

x	1	2	3	4	5	6	7	8	9
f	8	10	11	16	20	25	15	9	6

22. Find the mean deviation from the mean and standard deviation of arithmetic progression of *n* numbers.
23. Differentiate between Skewness and Kurtosis.
24. State and prove any two properties of regression coefficients.
25. Take four identical marbles. On the first write symbols $A_1A_2A_3$. On each of the other write A_1, A_2, A_3 respectively. Put the four marbles in an urn and draw one at random. Let Ei denote the event that the symbols Ai appears on the drawn marbles. Check whether the Events Ei are mutually independent or not.
26. How do the axiomatic definition and classical definition of probability differ from each other?

27. Suppose that X has a pdf.

$$f(x) = 2x\ ; 0 < x < 1,$$
$$= 0\ ; elsewhere.$$

Find the pdf of $Y = 3X + 1$.

28. Verify whether the following function is a CDF or not.

$$F(x) = 0; if\ x < 0,$$
$$= x; if\ 0\ \leq x < 0.5$$
$$= 1; if\ x \geq 0.5\ .$$

(6 × 4 = 24 Marks)

Part D. Answer any *two* questions. Each carries *fifteen* marks.

29. Obtain the rank correlation coefficient for the following data.

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

30. Four roads lead away from county jail. A prisoner has escaped from the jail and selects a road at random. If road 1 is selected, the probability of escaping is 1/8. If road 2 is selected, the probability of escaping is 1/6. For road 3 is 1/4 and for road 4 is 9/10. What is the probability he will not be succeeded in escaping? If the prisoner succeeds, what is the probability that, he has selected road 4 for escaping. If the prisoner does not, what is the probability that, he has selected road 2 for escaping?

31. An experiment consists of 3 independent tosses of the fair coin. Let X = the number of head, Y = the number of head runs, Z = the length of the head runs. The head runs are being defined as the consecutive occurrences at least two heads, its length being the number of heads occurring together in the 3 tosses of the coins. Find the probability mass function of:

- X
- Y
- X+Y
- Z
- XY.

(2 × 15 = 30 Marks)