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MCA/M-25 **24658**

MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

Paper–M24-CAP-207

Time : Three Hours] [Maximum Marks : 70

Note : Attempt *five* questions in all. Question Number 1 is compulsory. In addition to compulsory question, attempt *four* more questions selecting exactly *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) Define a set. Give one example.

(b) State the difference between reflexive and irreflexive relations.

(c) What are eigenvalues?

(d) What is the difference between population and sample?

(e) What is the purpose of calculating Kurtosis?

(f) Define bivariate data with an example.

(g) Write the formula for simple linear regression line.

(7×2=14)

UNIT–I

2. (a) **Prove or disprove : If a relation is symmetric and transitive, it must be reflexive.** 7

(b) Use Pigeonhole Principle : In a group of 13 people, show that at least two have birthdays in the same month. 7

3. Let A = {*a*, *b*, *c*}. Define a relation R on A × A such that R = {((*a*, *b*), (*a*, *b*)), ((*a*, *b*), (*b*, *a*)), ((*b*, *a*), (*a*, *b*)), ((*b*, *a*), (*b*, *a*))}.

(a) Is R an equivalence relation?

(b) Draw its graph representation.

(c) Find its transitive closure. 14

UNIT–II

4. (a) Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$. 7

(b) Find A^{-1}, where $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$. 7

5. (a) Prove the distributive law in matrix algebra : A(B + C) = AB + AC with suitable matrices. 7

(b) Compute the values of $I = \int_0^1 \frac{1}{1+x^2} dx$

by using the trapezoidal rule with h = 0.5, 0.25 and 0.125. 7

UNIT–III

6. (a) Differentiate between qualitative and quantitative data, and explain four scales of measurement with examples. 7

(b) Compute the standard deviation and coefficient of variation for the data : 4,8,6,5,3,7,9. 7

7. (a) Explain the procedure to calculate arithmetic, geometric and harmonic mean if you are given continuous frequency distribution. 7

(b) Define skewness and explain the difference between positive, negative, and zero skewness with the help of diagrams. 7

UNIT–IV

8. (a) Fit a straight line to the following data :

x :	0	1	2	3	4	5	6
y :	7	3	1	0	3	7	13

7

(b) Calculate the coefficient of correlation between x and y :

x :	22	24	25	27	21	22	23
y :	41	44	45	48	40	42	44

7

9. (a) A card is drawn from a well-shuffled pack of 52 cards. What is the probability that it is : (i) a red card, (ii) a king, (iii) not a spade? 7

(b) Define and differentiate classical, statistical, and axiomatic definition of probability. 7
