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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2022-23 ONLY)

SUBJECT CODE 22UCT1A1

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022

B.Sc.-COMPUTER TECHNOLOGY **MAXIMUM MARKS: 50**

SEMESTER : I **TIME : 3 HOURS**

PART – III

MATHEMATICS – I

MATHEMATICAL STRUCTURES FOR COMPUTER SCIENCE

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS. (K1)

1. If 0,3,4 are the eigen values of a square matrix of order 3, then the characteristic equation is

   (a) $\lambda^2 - 7\lambda+12 = 0$ (c) $\lambda^3 - 7\lambda^2 + 12\lambda = 0$

   (b) $\lambda^3 - 7\lambda^2 + 12\lambda+12 = 0$ (d) $\lambda^3 + 7\lambda^2 - 12\lambda = 0$

2 In Gauss Elimination method, the coefficient matrix is transformed into ____ matrix

   (a) upper triangular (b) unit (c) lower triangular (d) diagonal

3. Newton's forward and backward interpolation formula will be used for ____ intervals

   (a) unequal (b) equal (c) infinite (d) finite

4. The mode score on 6th grade math test was 94 Which of these interpretations must be true?

   (a) More students received a 94 than any other score (b) No one scored below a 50

   (c) 99 is the highest score in the class (d) A score of 91 was slightly below average

5. If all the values fall on the same straight line and the line has a positive slope then the value of the correlation coefficient 'r' is ____

   (a) $0 \leq r \leq 1$ (b) $r \geq 0$ (c) $r = +1$ (d) $r = -1$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. Define orthogonal matrix.

7. What is the order of convergence of Newton Raphson Method?

8. Write the order of error in Simpson's formula.

9. Find the quartile deviation if the quartile range is 24?

10. What is the condition for two regression lines to be parallel?

(CONTD……..2)

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(Qn. No. 11 to 15) Questions for Short Answers with internal choices. (K3)

11. a) Two of the eigen values of A = $\begin{pmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{pmatrix}$ are 3 and 6. Find the eigen values of A^{-1}

(OR)

b) Find the rank of the matrix $\begin{pmatrix} 2 & 1 & 1 & 5 \\ 1 & 1 & 1 & 4 \\ 1 & -1 & 2 & 1 \end{pmatrix}$

12. a) Find a root of $\cos x = xe^x$ by Newton's method.

(OR)

b) Solve the system of equations by Gauss-Elimination method 10x-2y+3z=23, 2x+10y-5z=-33, 3x-4y+10z=41.

13. a) Use Newton's backward difference formula to construct an interpolating polynomial of degree 3 for the data: f(-0.75) = -0.07181250, f(-0.5) = -0.024750, f(-0.25) = 0.33493750, f(0) = 1.10100. Hence find f(-1/3).

(OR)

b) Using Simpson's one third rule, evaluate the value of $\int_0^1 xe^x dx$ by taking 4 intervals. Compare your result with actual value.

14. a) A sequence consists of 7 terms arranged in descending order. The mean value of the sequence is 70. If 30 is added to each term, and then each term is divided by 2 to get the new mean as 'K'. Find the difference between K and the original mean.

(OR)

b) The following table shows the grouped data, in classes, for the heights of 50 people.

height (in cm) - classes	120 - 130	130 - 140	140 - 150	150 – 160	160 - 170
frequency	2	5	25	10	8

Calculate the mean and Standard deviation

15. a) Distinguish the difference between correlation and regression.

(OR)

b) The regression equation for variables x and y are 7x – 3y – 18 = 0 and 4x – y – 11 = 0. Find the (i) mean for x and y (ii) correlation coefficient between x and y.

(CONTD……..3)

SECTION - C (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) Find the inverse of the matrix A = $\begin{pmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$

(OR)

b) Find the eigen values and eigen vectors of $\begin{bmatrix} 6 & -6 & 5 \\ 14 & -13 & 10 \\ 7 & -6 & 4 \end{bmatrix}$

17. a) Solve the following system of equations by Gauss Seidel method correct to three decimal places 4x+2y+z=14, x+5y-z=10, x+y+8z=20.

(OR)

b) Find a root of an equation $f(x) = x^3 - x - 1$ using Bisection method.

18. a) Compute $f'(0.5)$ and $f''(3.5)$ from the given data

X	0	1	2	3	4
Y	1	2.718	7.381	20.086	54.598

(OR)

b) Apply fourth order Runge-Kutta method to determine y(0.2) with h = 0.2 from $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, where y(0) = 1.

19. a) The length of 20 similar crystals is measured (in mm) in a chemistry experiment. Calculate the standard deviation and the coefficient of variation for the observations taken.

Crystal No.	1	2	3	4	5	6	7	8	9	10
Length (mm)	9	2	5	4	12	7	8	11	9	3

Crystal No.	11	12	13	14	15	16	17	18	19	20
Length (mm)	7	4	12	5	4	10	9	6	9	4

(OR)

(CONTD……..4)

b) Explain the relationship between mean, median and mode and hence find the following

(i) The mean and median of a moderately skewed distribution are 42.2 and 41.9 respectively. Find mode of the distribution.

(ii) For a moderately skewed distribution, the median price of men's shoes is Rs 380 and modal price is Rs 350. Calculate mean price of shoes.

20. a) From the data given below, compute the (i) correlation coefficient r (ii) the coefficients of the linear regression line, $y = b_1x + b_0$ (iii) the estimated value for X = 80.

X	72	73	75	76	77	78	79	80
Y	45	38	41	35	31	40	25	32

X	80	81	82	83	84	85	86	88
Y	36	29	34	38	26	32	28	27

(OR)

b) Compute the coefficient of rank correlation between Eco. marks and Statistics marks as given below :

Eco Marks	80	56	50	48	50	62	60
Stat Marks	90	75	75	65	65	50	65

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ETHICAL PAPER