STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2023 – 2024 and thereafter)

B.Com.(A&F) DEGREE EXAMINATION, NOVEMBER 2024
THIRD SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICS FOR COMMERCE
SUBJECT CODE : 23MT/AC/MT35
TIME : 3 HOURS MAX. MARKS: 100

Q. No.	**SECTION A ($5 \times 2 = 10$)** **Answer ANY FIVE questions**	CO	KL
1.	Show that 0 is a characteristic root of a matrix if and only if the matrix is singular.	1	1
2.	Solve $x^3 - 3x^2 - 4x + 12 = 0$ given that sum of two roots is zero.	1	1
3.	State Newton-Raphson's formula for solving $f(x) = 0$.	1	1
4.	Write the Newton's backward difference formula to compute the derivative of $y = f(x)$ at $x = x_0$.	1	1
5.	State Simpson's three eighth rule.	1	1
6.	Define feasible solution of a linear programming problem.	1	1

Q. No.	**SECTION B ($10 \times 1 = 10$)** **Answer ALL questions**	CO	KL
7.	Which of the following is not a type of matrix? a) Identity Matrix b) Scalar Matrix c) Hermitian Matrix d) Logarithmic Matrix	2	2
8.	A matrix is diagonalizable if: a) It has distinct eigenvalues b) It is symmetric c) It is skew-symmetric d) It has a determinant of zero	2	2
9.	If the sum of the roots of a quadratic equation is 5 and the product is 6, then the equation is: a) $x^2 - 5x + 6 = 0$ b) $x^2 + 5x + 6 = 0$ c) $x^2 - 6x + 5 = 0$ d) $x^2 + 6x + 5 = 0$	2	2
10.	The equation whose roots are reciprocals of the roots of $ax^2 + bx + c = 0$ is: a) $ax^2 + cx + b = 0$ b) $ax^2 + bx + 1 = 0$ c) $bx^2 + cx + a = 0$ d) $cx^2 + bx + a = 0$	2	2
11.	Gauss-Seidel iteration method is preferred over Gauss-Jacobi method because: a) It is easier to implement b) It converges faster c) It does not require matrix inversion d) It is used for symmetric matrices only	2	2

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12.	Simpson's $\frac{1}{3}$ rule is applicable for: a) Discontinuous functions b) Evenly spaced data points c) Unevenly spaced data points d) Integrals of complex functions	2	2
13.	Newton's forward difference formula is used to approximate: a) Derivatives b) Integrals c) Zeros of a function d) Solutions of differential equations	2	2
14.	A linear programming problem involves: a) Linear objective function and linear constraints b) Nonlinear objective function and linear constraints c) Linear objective function and nonlinear constraints d) Nonlinear objective function and nonlinear constraints	2	2
15.	The feasible region in a linear programming problem is: a) Convex b) Concave c) Linear d) Bounded	2	2
16.	Canonical form of an L.P.P. refers to: a) A specific solution technique b) The maximization problem c) Standard representation of constraints d) None of the above	2	2

Q. No.	**SECTION C ($2 \times 15 = 30$)** **Answer ANY TWO questions**	CO	KL
17.	If A is a square matrix of order n, then prove that $A + A^T$ is symmetric and $A - A^T$ is skew symmetric. Hence express the matrix $\begin{bmatrix} 0 & 5 & -3 \\ 1 & 1 & 1 \\ 4 & 5 & 9 \end{bmatrix}$ as a sum of symmetric and skew symmetric matrices.	3	3
18.	Solve the following system of equations using Gaussian elimination and Gauss Jordan methods: $5x - 2y + 3z = 18$ $x + 7y - 3z = -22$ $2x - y + 6z = 22$	3	3
19.	Find $y'(0)$ and $y''(0)$ from the following table: x: 0, 1, 2, 3, 4, 5 y: 4, 8, 15, 7, 6, 2	3	3

20.	Use Big – M method to solve Minimize $Z = 4x_1 + 3x_2$ subject to $2x_1 + x_2 \geq 10$ $-3x_1 + 2x_2 \leq 6$ $x_1 + x_2 \geq 6$ $x_1, x_2 \geq 0$	3	3

Q. No.	**SECTION D ($2 \times 15 = 30$)** **Answer ANY TWO questions**	CO	KL
21.	State and verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and hence find its inverse.	4	4
22.	If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, then find (i) $\sum\alpha^2$ (ii) $\sum\alpha^2\beta$ (iii)$\sum\alpha^2\beta^2$ (iv) $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)$	4	4
23.	Is the following system of equations diagonally dominant? If not, make it diagonally dominant and solve using Gauss Seidal iteration method. $6x + 15y + 2z = 72; x + y + 54z = 110; \quad 27x + 6y - z = 85$	4	4
24.	Compare the value of $\int_0^{10} \frac{dx}{1+x^2}$ obtained using Trapezoidal rule and Simpson's one third rule.	4	4

Q. No.	**SECTION E ($2 \times 10 = 20$)** **Answer ANY TWO questions**	CO	KL
25.	Determine the eigen values and eigen vectors of the matrix $A =$ $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.	5	5
26.	Form the equation with rational coefficients whose roots are $1 + i$ and $-2 + \sqrt{3}$.	5	5
27.	Find the root of $x^3 - 9x + 1 = 0$ using bisection method.	5	5
28.	Solve the following linear programming problem: Maximize $Z = 3x_1 + 2x_2 + 5x_3$ subject to $x_1 + 4x_2 \leq 420$ $3x_1 + 2x_3 \leq 460$ $x_1 + 2x_2 + x_3 \leq 430$ $x_1, x_2, x_3 \geq 0$	5	5