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

B.COM. DEGREE EXAMINATION - NOVEMBER 2024
HONOURS
THIRD SEMESTER

COURSE	:	**ALLIED CORE**
PAPER	:	**MATHEMATICS FOR COMMERCE**
SUBJECT CODE	:	**23BH/AC/MC35**
TIME	:	**3 HOURS**

MAX. MARKS: 100

Q. No.	SECTION A Answer ANY FIVE questions: $(5 \times 2 = 10)$	CO	KL
1.	Define a symmetric matrix and verify if the following matrix is symmetric: $\begin{pmatrix} 1 & 3 & 5 \\ 0 & 4 & 2 \\ 0 & 0 & 0 \end{pmatrix}$.	1	1
2.	Define Hermitian matrix with an example.	1	1
3.	If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + 7x^3 + x + 5 = 0$, find the value of $\sum \alpha$.	1	1
4.	Find the first approximation of the root lying between 0 and 1 of the equation $x^3 + 3x - 1 = 0$ by Newton-Raphson formula.	1	1
5.	State Newton's Backward Difference Formula.	1	1
6.	Give the characteristics of the standard form of linear programming problem.	1	1
Q. No.	**SECTION B** **Answer ALL questions:** $(\mathbf{10 \times 1 = 10})$	**CO**	**KL**
7.	The inverse of a matrix is ___________ (a) not defined (b) unique (c) similar (d) scalar	2	2
8.	If *A* is a square matrix of order *n*, then $A + \overline{A^T}$ is ___________ (a) symmetric (b) scalar (c) Hermitian (d) diagonal	2	2
9.	Any n^{th} degree polynomial has at least ______ roots (a) n (b) $n + 1$ (c) $n + 2$ (d) $n + 3$	2	2
10.	Which of the following is a characteristic of a reciprocal equation? (a) The roots of the equation are equal in magnitude but may or may not be opposite in sign. (b) The roots of the equation are reciprocals of each other. (c) The equation has only real roots. (d) All of the above	2	2
11.	What is the key assumption of the Gauss-Jacobi Iteration Method for solving a system of linear equations? (a) The matrix must be upper triangular (b) The system must be symmetric (c) The coefficient matrix must be diagonally dominant (d) The system must have a unique solution	2	2
12.	The root of $f(x) = 3x - 1$ lies between _________ (a) 1 and 3 (b) 0 and 1 (c) 4 and 5 (d) 1 and 2	2	2

13.	The process of evaluating a definite integral from a set of tabulated values of the integrand *f*(x), which is not known explicitly is called ______________ (a) Numerical subtraction (b) Numerical integration (c) Numerical Differentiation (d) None of the above	2	2
14.	If n = 3 is replaced in Newton-Cote's formula, then after simplification we obtain the ___________________. (a) Trapezoidal rule (b) Simpson's one-third rule (c) Simpson's three-eighth rule (d) Weddle's rule	2	2
15.	In a Linear Programming Problem, the objective function is a __________________. (a) quadratic equation to be maximized or minimized (b) linear equation to be maximized or minimized (c) constraint that limits the solution (d) nonlinear equation used to find optimal solutions	2	2
16.	Which of the following is not a characteristic of constraints in a Linear Programming Problem? (a) they are always linear (b) they represent limitations on resources (c) they can include equality and inequality relations (d) they are nonlinear equations	2	2
Q. No.	**SECTION C** **Answer ANY TWO questions:** $(\mathbf{2 \times 15 = 30})$	**CO**	**KL**
17.	Diagonalize the following matrix: $\begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ -4 & 4 & 3 \end{pmatrix}$	3	3
18.	(a) Solve the equation $x^4 - 6x^3 + 11x^2 - 10x + 2 = 0$ given that $2 + \sqrt{3}$ is a root. (b) If the equation $x^3 - 6x^2 + 11x - 21 = 0$ has the roots α, β, γ find the values of (i) $(\beta + \gamma)(\gamma + \alpha)(\alpha + \beta)$ (ii) $\sum \alpha^2 \beta$ **(8 + 7)**	3	3
19.	Find the inverse of the following matrix by Gauss-Jordan method: $A = \begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$	3	3
20.	Using Big – *M* method, solve the following linear programming problem: Minimize $Z = 4x_1 + 3x_2$ subject to $2x_1 + x_2 \geq 10$ $-3x_1 + 2x_2 \leq 6$ $x_1 + x_2 \geq 6$ and $x_1, x_2 \geq 0$	3	3

Q. No.	**SECTION D** **Answer ANY TWO questions:** $(\mathbf{2 \times 15 = 30})$	**CO**	**KL**
21.	(a) Express the following matrix as the sum of a symmetric and a skew-symmetric matrix: $\begin{pmatrix} 0 & 5 & -3 \\ 1 & 1 & 1 \\ 4 & 5 & 9 \end{pmatrix}$ (b) Show that the following matrices have the same characteristic equation: $\begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}, \begin{pmatrix} b & c & a \\ c & a & b \\ a & b & c \end{pmatrix}, \begin{pmatrix} c & a & b \\ a & b & c \\ b & c & a \end{pmatrix}$ **(8 + 7)**	4	4
22.	(a) Solve the equation $x^3 - 4x^2 - 3x + 18 = 0$ given that two of its roots are equal. (b) Form the equation whose roots are $\sqrt{5} + \sqrt{3}$. **(8 + 7)**	4	4
23.	(a) Find $y'(x)$ given x: 0, 1, 2, 3, 4 $y(x)$: 1, 1, 15, 40, 85 Hence find $y'(x)$ at $x = 0.5$. (b) Find the positive real root of $x^3 - 3x + 1 = 0$ using the Bisection method in 4 stages. **(7 + 8)**	4	4
24.	Use simplex method to solve: $Maximize\ Z = 3x_1 + 2x_2 + 5x_3$ subject to $x_1 + 4x_2 \leq 420$ $3x_1 + 2x_3 \leq 460$ $x_1 + 2x_2 + x_3 \leq 430$ and $x_1, x_2, x_3 \geq 0$.	4	4
Q. No.	**SECTION E** **Answer ANY TWO questions:** $(\mathbf{2 \times 10 = 20})$	**CO**	**KL**
25.	Verify Cayley-Hamilton theorem for the following matrix: $\begin{pmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{pmatrix}$.	5	5
26.	Solve the equation $3x^6 + x^5 - 27x^4 + 27x^2 - x - 3 = 0$.	5	5
27.	Solve the following system of equations using Gauss Seidel iteration method: $6x + 15y + 2z = 72;\ x + y + 54z = 110;\ 27x + 6y - z = 85$	5	5
28.	Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using (i) Trapezoidal rule (ii) Simpson's one third rule.	5	5

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