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

B. COM DEGREE EXAMINATION, APRIL 2026
COMMERCE
FOURTH SEMESTER

COURSE	**:**	**ALLIED CORE**
PAPER	**:**	**MATHEMATICS FOR COMMERCE**
SUBJECT CODE	**:**	**23MT/AC/MT45**
TIME	**:**	**3 HOURS**

MAX. MARKS: 100

Q. No.	**SECTION A** $(\mathbf{5 \times 2 = 10})$ **Answer ANY FIVE questions**	**CO**	**KL**
1.	State Cayley Hamilton theorem.	1	1
2.	Find the equation whose roots are 1 and $1 - \sqrt{2}$.	1	1
3.	Write Newton-Raphson's formula.	1	1
4.	State Simpson's one third rule.	1	1
5.	What are slack and surplus variables?	1	1
6.	Define degenerate and non-degenerate basic solution.	1	1
Q. No.	**SECTION B** $(\mathbf{10 \times 1 = 10})$ **Answer ALL questions**	**CO**	**KL**
7.	An application of Cayley Hamilton theorem is to find the ________________ of the matrix. a) inverse b) eigen vectors c) eigen values d) All of the above	2	2
8.	A square matrix A is an unitary matrix if _______. a) a) $AA^{\theta} = I$ b) $A^{T}A = I$ c) $A^{\theta}A^{T} = I$ d) None of these	2	2
9.	If $a + \sqrt{b}$ is a root, then _______ is also a root. a) $a - \sqrt{b}$ b) $\sqrt{a} + \sqrt{b}$ c) $\sqrt{a} - b$ d) None of these	2	2
10.	For a cubic equation whose roots are in geometric progression, the general roots can be assumed to be __________________. a) $\alpha + \beta, \alpha\ ,\ \alpha - \beta$ b) $\alpha, \alpha - 2k, \alpha + k$ c) $\frac{\alpha}{\beta}, \alpha,\ \alpha\beta$ d) $\frac{1}{\alpha}, \frac{1}{\beta}, \frac{1}{?}$	2	2
11.	The method of tangents is also known as ______. a) Newton-Raphson's method b) Bolzano method c) Gauss-Elimination method d) None of these	2	2

12.	Gauss Elimination comes under _____ method. a) Direct method b) Indirect method c) Iterative method d) None of these	2	2
13.	Simpson's three eighth rule is obtained from _____________. a) Trapezoidal Rule b) Newton – Cote's formula c) Simpson's one third rule d) None of the above	2	2
14.	The error in Trapezoidal rule is of order _______. a) h^2 b) h^3 c) h^4 d) h^5	2	2
15.	Any solution to a LPP which satisfies the non-negativity restrictions of the LPP is called its _______. a) solution b) optimal Solution c) basic solution d) feasible solution	2	2
16.	Big M – method is also referred as _____________ a) Two phase method b) *cycling* c) Method of penalties d) None of the above	2	2
Q. No.	**SECTION C** $(\mathbf{2 \times 15 = 30})$ **Answer ANY TWO questions**	**CO**	**KL**
17.	Verify Cayley-Hamilton theorem and hence find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$.	3	3
18.	a) Solve the equation $x^3 - 9x^2 + 14x + 24 = 0$ if two of the roots are in the ratio 3:2. b) Solve the equation $32x^3 - 48x^2 + 22x - 3 = 0$ given that the roots are in A.P. **(9+6)**	3	3
19.	Find the real root of the equation $x^3 - 3x + 1 = 0$ which lies between 1 and 2 correct to three places of decimal using bisection method.	3	3
20.	Solve the LPP using simplex method: Maximize $z = 4x_1 + 10x_2$ Subject to $2x_1 + x_2 \leq 50$ $2x_1 + 5x_2 \leq 100$ $2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$	3	3

<table>
<tr><th>Q.
No.</th><th>SECTION D ($2 \times 15 = 30$)
Answer ANY TWO questions</th><th>C
O</th><th>K
L</th></tr>
<tr><td>21.</td><td>Every square matrix can be uniquely expressed as a sum of a symmetric and a skew-symmetric matrix. Justify and express the same for the matrix $\begin{bmatrix} 0 & 5 & -3 \\ 1 & 1 & 1 \\ 4 & 5 & 9 \end{bmatrix}$.</td><td>4</td><td>4</td></tr>
<tr><td>22.</td><td>Find the root of the equation $3x - \cos x - 1 = 0$ correct to four places of decimal, the root between 0 and 1 by using Newton-Raphson's method.</td><td>4</td><td>4</td></tr>
<tr><td>23.</td><td>Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using Trapezoidal rule and Simpson's one third rule.</td><td>4</td><td>4</td></tr>
<tr><td>24.</td><td>Apply Big – M method to solve the following:
Minimize $Z = 4x_1 + 3x_2$
Subject to $2x_1 + x_2 \geq 10$
$-3x_1 + 2x_2 \leq 6$
$x_1 + x_2 \geq 6$
$x_1, x_2 \geq 0$</td><td>4</td><td>4</td></tr>
<tr><th>Q.
No.</th><th>SECTION E ($2 \times 10 = 20$)
Answer ANY TWO questions</th><th>C
O</th><th>K
L</th></tr>
<tr><td>25.</td><td>Find the eigen values and eigen vectors for the matrix $A = \begin{pmatrix} 1 & 2 \\ 5 & 4 \end{pmatrix}$.</td><td>5</td><td>5</td></tr>
<tr><td>26.</td><td>If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$ find
(i) $\sum \alpha^2$ (ii) $\sum \alpha^2 \beta$ (iii)$\sum \alpha^2 \beta^2$ (iv) $(\alpha + \beta)(\beta + \gamma)(\gamma + \alpha)$</td><td>5</td><td>5</td></tr>
<tr><td>27.</td><td>Solve the following system of equations by Gaussian elimination method:
$x + y + z = 9$
$2x - 3y + 4z = 13$
$3x + 4y + 5z = 40$</td><td>5</td><td>5</td></tr>
<tr><td>28.</td><td>The population of a certain town is shown in the following table; find the rate of growth of the population in 1961.
<table>
<tr><td>$Year \quad x$</td><td>1931</td><td>1941</td><td>1951</td><td>1961</td><td>1971</td></tr>
<tr><td>$Population\ y$</td><td>40.62</td><td>60.80</td><td>79.95</td><td>103.56</td><td>132.65</td></tr>
</table></td><td>5</td><td>5</td></tr>
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