

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2025 – 2026)

B.Sc. DEGREE EXAMINATION, APRIL 2026
BRANCH IV- CHEMISTRY
SECOND SEMESTER

COURSE : ELECTIVE
PAPER : MATHEMATICS FOR CHEMISTRY-II
SUBJECT CODE : 25MT/ME/MC23
TIME : 3 HOURS **MAX. MARKS: 100**

Q. No.	SECTION A (2×5 = 10) Answer any TWO questions	CO	KL														
1.	Derive Laplace transform of $f''(t)$.	1	1														
2.	State the properties of coefficient of correlation.	1	1														
3.	Define group and commutative group.	1	1														
Q. No.	SECTION B (2×5 = 10) Answer any TWO questions	CO	KL														
4.	Estimate the value of $L^{-1}\left(\frac{s}{s^2+6s+13}\right)$	2	2														
5.	Find the regression line X on Y for the data: <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">Y</td> </tr> <tr> <td style="text-align: center;">Mean</td> <td style="text-align: center;">60</td> <td style="text-align: center;">120</td> </tr> <tr> <td style="text-align: center;">Standard deviation</td> <td style="text-align: center;">3.36</td> <td style="text-align: center;">7.24</td> </tr> <tr> <td style="text-align: center;">Coefficient of correlation</td> <td colspan="2" style="text-align: center;">+ 0.98</td> </tr> </table>		X	Y	Mean	60	120	Standard deviation	3.36	7.24	Coefficient of correlation	+ 0.98		2	2		
	X	Y															
Mean	60	120															
Standard deviation	3.36	7.24															
Coefficient of correlation	+ 0.98																
6.	Find the correlation coefficient and standard deviation of Y , given $\sigma_x = 3$, $b_{xy} = 0.85$ and $b_{yx} = 0.89$.	2	2														
Q. No.	SECTION C (2×10 = 20) Answer any TWO questions	CO	KL														
7.	Calculate $L(t^2 \sin 2t)$.	3	3														
8.	Demonstrate whether the set $S = \{1, -1, i, -i\}$ under multiplication is an abelian group where $i^2 = -1$.	3	3														
9.	Calculate the regression equation of Y on X for the given data by taking deviations from the actual means of X and Y : <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">Price (Rs.)</td> <td style="text-align: center;">10</td> <td style="text-align: center;">12</td> <td style="text-align: center;">13</td> <td style="text-align: center;">12</td> <td style="text-align: center;">16</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">Amount demanded</td> <td style="text-align: center;">40</td> <td style="text-align: center;">38</td> <td style="text-align: center;">43</td> <td style="text-align: center;">45</td> <td style="text-align: center;">37</td> <td style="text-align: center;">43</td> </tr> </table> <p>Also estimate the demand when the price is Rs. 20.</p>	Price (Rs.)	10	12	13	12	16	15	Amount demanded	40	38	43	45	37	43	3	3
Price (Rs.)	10	12	13	12	16	15											
Amount demanded	40	38	43	45	37	43											

Q. No.	SECTION D (2×20 = 40) Answer any TWO questions	CO	KL																						
10.	Solve the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4$ subject to $y = 2$ and $\frac{dy}{dx} = 3$ when $x = 0$.	4	4																						
11.	a) Simplify (1 3 5)(5 4 3 2)(5 6 7 8) as a product of disjoint cycles and determine whether the permutation is even or odd. b) Distinguish between the correlation and regression. (10 + 10)	4	4																						
12.	Investigate the rank correlation coefficient for the table of marks of students in two subjects: <table border="1" data-bbox="375 770 1189 882"> <tbody> <tr> <td>Science</td> <td>48</td> <td>33</td> <td>40</td> <td>9</td> <td>16</td> <td>16</td> <td>65</td> <td>24</td> <td>16</td> <td>57</td> </tr> <tr> <td>Social Science</td> <td>13</td> <td>13</td> <td>24</td> <td>6</td> <td>15</td> <td>4</td> <td>20</td> <td>9</td> <td>6</td> <td>19</td> </tr> </tbody> </table>	Science	48	33	40	9	16	16	65	24	16	57	Social Science	13	13	24	6	15	4	20	9	6	19	4	4
Science	48	33	40	9	16	16	65	24	16	57															
Social Science	13	13	24	6	15	4	20	9	6	19															
Q. No.	SECTION E (2×10 = 20) Answer any TWO questions	CO	KL																						
13.	Evaluate $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$.	5	5																						
14.	Estimate the coefficient of correlation between the age of cars and annual maintenance cost for the given data and criticize the result: <table border="1" data-bbox="293 1229 1270 1397"> <tbody> <tr> <td>Age of cars (years)</td> <td>2</td> <td>4</td> <td>6</td> <td>7</td> <td>8</td> <td>10</td> <td>12</td> </tr> <tr> <td>Annual Maintenance cost (rupees)</td> <td>1600</td> <td>1500</td> <td>1800</td> <td>1900</td> <td>1700</td> <td>2100</td> <td>2000</td> </tr> </tbody> </table>	Age of cars (years)	2	4	6	7	8	10	12	Annual Maintenance cost (rupees)	1600	1500	1800	1900	1700	2100	2000	5	5						
Age of cars (years)	2	4	6	7	8	10	12																		
Annual Maintenance cost (rupees)	1600	1500	1800	1900	1700	2100	2000																		
15.	Estimate the Laplace transform for the function $f(t) = \begin{cases} e^{-t}, & 0 < t < 4 \\ 0, & t > 4 \end{cases}$.	5	5																						

