

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted from the academic year 2015-16)

SUBJECT CODE : 15MT/AC/MC25

B. Sc. DEGREE EXAMINATION, APRIL 2016
BRANCH IV - CHEMISTRY
SECOND SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICS FOR CHEMISTRY - II
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

ANSWER ALL THE QUESTIONS:

(10X2=20)

1. If G is a group, then prove that for every $a \in G$, $a^{-1}^{-1} = a$.
2. Define order of an element in a group G .
3. Find the Laplace transform of $\sin 3t$.
4. Find $L t^2 + e^{3t}$.
5. Find the inverse Laplace transform of $\frac{1}{s+2^2}$.
6. Find $L^{-1} \frac{s}{s^2+4^2}$.
7. Define an odd function and give an example.
8. If $f(x)$ is an even function in the interval $-\pi < x < \pi$ then write Fourier expansion for $f(x)$.
9. Evaluate $Cov X, Y$, if $XY = 520$, $n = 25$, $X = 5$ and $Y = 4$.
10. Define Probable error of correlation coefficient.

SECTION – B

ANSWER ANY FIVE QUESTIONS:

(5X8=40)

11. If S is the set of all rational numbers except 1, then prove that S is a group with respect to the operation $*$ defined by $a * b = a + b - ab$ for all $a, b \in S$.
12. Show that the intersection of two normal subgroups of G is a normal subgroup of G .
13. Find $L \sin^3 2t$.
14. Find the inverse Laplace transform of $\frac{s}{s+3^2+4}$.
15. Express $f(x) = x$ $-\pi < x < \pi$ as a Fourier series with period 2π .
16. Calculate the correlation coefficient for the following heights (in inches) of fathers X and their sons Y :

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

17. Ten competitors in a musical test were ranked by the three judges A, B and C in the following order:

Ranks by A (X)	1	6	5	10	3	2	4	9	7	8
Ranks by B (Y)	3	5	8	4	7	10	2	1	6	9
Ranks by C (Z)	6	4	9	8	1	2	3	10	5	7

Using rank correlation method, discuss which pair of judges has the nearest approach to common likings in music.

SECTION – C

ANSWER ANY TWO QUESTIONS:

(2X20=40)

18. (a) State and prove Lagrange's theorem.

(b) If $a \in G$, define $N_a = \{x \in G : ax = xa\}$. Show that N_a is a subgroup of G .(c) Express $(1, 3, 5)(5, 4, 3, 2), (5, 6, 7, 8)$ as a product of disjoint cycles.

(10+5+5)

19. (a) Solve the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$, given that $y = \frac{dy}{dx} = 0$ when $t = 0$.(b) A function $f(x)$ is defined within the range $[0, 2\pi]$ by the relations

$$f(x) = \begin{cases} x & , 0, \pi \\ 2\pi - x & , \pi, 2\pi \end{cases}. \text{ Express } f(x) \text{ as a Fourier series in the range } [0, 2\pi].$$

(10+10)

20. (a) Find the Laplace inverse transform of $\frac{s-3}{s^2+4s+13}$.

(b) The following table gives, according to age, the frequency of marks obtained by 100 students in an intelligence test:

Age in years →	18	19	20	21	Total
Marks ↓					
10 – 20	4	2	2	–	8
20 – 30	5	4	6	4	19
30 – 40	6	8	10	11	35
40 – 50	4	4	6	8	22
50 – 60	–	2	4	4	10
60 – 70	–	2	3	1	6
Total	19	22	31	28	100

Calculate the correlation coefficient.

(8+12)



