

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted from the academic year 2019-20 & thereafter)

SUBJECT CODE : 19MT/AC/MC25

B. Sc. DEGREE EXAMINATION, APRIL 2022

BRANCH IV - CHEMISTRY

SECOND SEMESTER

COURSE : ALLIED CORE

PAPER : MATHEMATICS FOR CHEMISTRY - II

TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

ANSWER ANY TEN QUESTIONS:

(10X2=20)

1. Write down the conditions for existence of Laplace transform of $f(t)$.
2. When is a function $f(t)$ said to be piecewise continuous in an interval $[a,b]$?
3. Find inverse Laplace transform of $f(t) = te^{-2t}$.
4. Find $L^{-1}\left(\frac{1}{(s+a)^2}\right)$.
5. Define periodic function with an example.
6. Write Dirichlet's conditions.
7. Define an odd function with a example.
8. State any two properties of correlation coefficient.
9. Write down two merits of rank correlation.
10. Let G be a group. Prove that $(ab)^{-1} = b^{-1}a^{-1} \forall a, b \in G$.
11. Define Cyclic group.
12. Define left coset of a subgroup H in G .

SECTION – B

ANSWER ANY FIVE QUESTIONS:

(5X8=40)

13. Obtain the Laplace transform for $f'(t)$ and $f''(t)$.
14. Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+2s+2)}$.
15. Solve the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$ using Laplace transform.
16. Find the Fourier sine series of $f(x) = \pi x - x^2$ in $(0, \pi)$.
17. Explain briefly the different types of correlation.
18. Let R_2 be a set of matrices of the form $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ where a, b, c, d are real and $ad - bc \neq 0$, Prove that R_2 is a group under matrix multiplication.
19. Define signature of a permutation and find the signature for the permutation

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}.$$

SECTION – C

ANSWER ANY TWO QUESTIONS:

(2X20=40)

20. a) Find the Laplace transform of $f(t) = t^2 \cos at$.

b) Prove that a subgroup N of a group G is a normal subgroup of G if and only if

$$gNg^{-1} = N \text{ for all } g \in G. \quad (10 + 10)$$

21. a) Expand $f(x) = \begin{cases} -x & \text{in } -\pi < x < 0 \\ x & \text{in } 0 < x < \pi \end{cases}$ as Fourier series in the interval $(-\pi, \pi)$.

b) Solve the equation $y'' + 4y' + 13y = 2e^{-x}$, given $y(0) = 0, y'(0) = -1$.

(8+12)

22. a) Calculate the rank correlation coefficient for the following data:

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	6	19

b) A person while calculating coefficient of correlation between two variables X and Y obtained the following results: $N = 25, \sum X = 125, \sum X^2 = 650,$

$\sum Y = 100, \sum Y^2 = 460$ and $\sum XY = 508$. However, later discovered at the

time of checking the calculations that two pairs of observations (6,14) and (8,6)

were wrongly entered instead of (8,12) and (6,8). Determine the correct value of

coefficient of correlation. (12+8)

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