

B. Sc. DEGREE EXAMINATION, APRIL 2019
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. Define normal subgroup.
2. If G is a group such that $a^2 = e$ for all $a \in G$, then prove that G is abelian.
3. Show that $L(e^{-at}) = \frac{1}{s+a}$ provided $s + a > 0$.
4. Show that $[f'(t)] = sL[f(t)] - f(0)$.
5. Find $L^{-1}\left(\frac{s-3}{(s-3)^2+4}\right)$.
6. Find $L^{-1}\left[\frac{s}{(s+2)^2}\right]$.
7. Define even function and odd function.
8. Express $f(x) = x(-\pi < x < \pi)$ as a Fourier series with period 2π .
9. Define correlation coefficient.
10. If $r = 0.6$ and $N = 64$, find out the probable error of the coefficient of correlation and determine the limits for population r .

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5X8=40)

11. Let G be a group. Let $H = \{a|a \in G \text{ and } ax = xa \text{ for all } x \in G\}$ (ie) H is the set of all elements which commute with all other element. Show that H is a subgroup of G .
12. Express $f(x) = \frac{1}{2}(\pi - x)$ as a Fourier series with period 2π , to be valid in the interval 0 to 2π .
13. Show that $L(t^n) = \frac{n!}{s^{n+1}}$ where n is a positive integer.
14. Find $L(e^{-at} \sin bt)$.
15. Find $L^{-1}\left(\frac{s-3}{s^2+4s+13}\right)$.
16. A computer while calculating correlation coefficient between two variables X and Y from 25 pairs if observations obtained the following results:
 $N = 25, \sum X = 125, \sum X^2 = 650, \sum Y = 100, \sum Y^2 = 460, \sum XY = 508$
It was however, later discovered at the time of checking that he had copied down two pairs as (6,14) and (8,6) while the correct values were (8,12) and (6,8). Obtain the correct value of correlation coefficient.
17. Obtain the rank correlation coefficient for the following data.

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

SECTION – C

ANSWER ANY TWO QUESTIONS:

(2X20=40)

18. a) Let G be a finite group with even number of elements. Prove that G contains at least one element of order 2. (12 Marks)
- b) Evaluate $L(\text{tsin } at)$. (8 Marks)

19. a) Evaluate $L^{-1}\left[\frac{1}{(s+1)(s^2+2s+2)}\right]$. (5 Marks)

b) Solve the equation $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 13y = 2e^{-x}$, given $y = 0$, $\frac{dy}{dx} = -1$ when $x = 0$ (15 Marks)

20. a) Calculate Karl Pearson's coefficient of correlation from the following data. (10 Marks)

Age of mother's in years	Age of daughters in years					Total
	5-10	10-15	15-20	20-25	25-30	
15-25	6	3	-	-	-	9
25-35	3	16	10	-	-	29
35-45	-	10	15	7	-	32
45-55	-	-	7	10	4	21
55-65	-	-	-	4	5	9
Total	9	29	32	21	9	100

- b) Show that in $0 \leq x \leq \pi$, $x(\pi - x) = \frac{\pi^2}{6} - 4\left[\frac{\cos 2x}{2^2} + \frac{\cos 4x}{4^2} + \frac{\cos 6x}{6^2} + \dots \infty\right]$. Deduce the sum of the series $\frac{1}{1^2} - \frac{1}{2^2} - \frac{1}{3^2} - \frac{1}{4^2} \dots \infty$. (10 Marks)

