

**B. Sc. DEGREE EXAMINATION, NOVEMBER 2018**  
**BRANCH IV - CHEMISTRY**  
**FIRST SEMESTER**

**COURSE : ALLIED – CORE**  
**PAPER : MATHEMATICS FOR CHEMISTRY – I**  
**TIME : 3 HOURS**

**MAX. MARKS : 100**

**SECTION – A** **(10 X 2 = 20)**  
**ANSWER ALL THE QUESTIONS**

1. State Cayley Hamilton theorem.
2. Find the eigen value of the matrix  $A = \begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$ .
3. If  $\alpha$  and  $\beta$  are the roots of  $2x^2 + 3x + 5 = 0$  find  
a)  $\alpha + \beta$                       b)  $\alpha \beta$
4. Diminish the roots of  $x^4 - 5x^3 + 7x^2 - 4x + 5 = 0$  by 2 and find the transformed equation.
5. Find the  $n^{th}$  derivative of  $\frac{1}{ax+b}$ .
6. Evaluate  $\int \frac{1}{(x+1)\sqrt{1-x^2}} dx$ .
7. From the partial differential equation by eliminating arbitrary constants from  $z = (x^2 + a)(y^2 + b)$ .
8. Solve  $px + qy = z$ .
9. State Newton's backward interpolation formula.
10. Define the 'difference operators'  $\Delta$  and  $E$ .

**SECTION – B** **(5 X 8 = 40)**  
**ANSWER ANY FIVE QUESTIONS**

11. Verify Cayley - Hamilton theorem for  $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$
12. Solve the equation  $x^4 + 2x^3 - 16x^2 - 22x + 7 = 0$  which has a root  $2 + \sqrt{3}$ .
13. Solve the equation  $3x^3 - 26x^2 + 52x - 24 = 0$ . Whose roots are in G.P ?
14. Find the  $n^{th}$  derivative of  $\frac{1}{(x+1)(x+3)}$ .
15. Evaluate  $\int \frac{dx}{(x+2)\sqrt{x+3}}$ .
16. Solve  $p^2 + q^2 = 4$ .
17. Find  $f(5)$  from the following:

$x :$	3	4	6
$f(x) :$	4	13	43

**SECTION – C**  
**ANSWER ANY TWO QUESTIONS**

(2 X 20 = 40)

18. Find eigen value and eigen vectors of

a) 
$$\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & -1 \\ -7 & 2 & -3 \end{bmatrix}$$

b) Solve  $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$ .

19. a) If  $y = a \cos(\log x) + b \sin(\log x)$  show that

$$x^2 y_2 + x y_1 + y = 0 \text{ and } x^2 y_{n+2} + (2n + 1) x y_{n+1} + (n^2 + 1) y_n = 0.$$

b) Evaluate  $\int \frac{dx}{(x-1)\sqrt{x^2+2x-8}}$ .

20. a) Solve  $z(x - y) = x^2 p - y^2 q$ .b) A function  $f(x)$  given by the following table.Find  $f(0.2)$  by Newton's forward formula:

$x$	0	1	2	3	4	5	6
$f(x)$	176	185	194	203	212	220	229

