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(FOR THE CANDIDATES ADMITTED IN 2022 ONWARDS)
DURING THE ACADEMIC YEARS 2022-2023

22UCY1A1

Reg N

**N.G.M COLLEGE (AUTONOMOUS): POLLACHI**

**END–OF –SEMESTER EXAMINATIONS: DECEMBER 2022**

**COURSE NAME: B. Sc.- CHEMISTRY** **MAX. MARKS: 50**
**SEMESTER: I** **TIME: 3 HOURS**

## ANCILLARY MATHEMATICS FOR CHEMISTRY - I

### SECTION – A

**ANSWER THE FOLLOWING QUESTION. (10 X1 =10 MARKS) [K1]**

1. In a skew symmetric matrix, $a_{ij}$ = __________.
   a) $a_{ji}$ b) $-a_{ji}$ c) $a_{ji}^{-1}$ d) none
2. Every polynomial equation f (x) = 0 has at least -------- real or complex root.
   a) one b) two c) three d) n
3. Infinite series is also called ------ series.
   a) binomial b) logarithmic c) exponential d) none
4. Gauss elimination method is a -------- method.
   a) direct b) iteration c) both d) none
5. $\Gamma(1)$ = ------
   a) 0 b) 1 c) 2 d) n!

**ANSWER THE FOLLOWING IN ONE OR TWO SENTENCES. [K2]**

6. Write the formula for inverse of the matrix A.
7. Is a polynomial equation with real coefficients imaginary occur in?
8. Define exponential series.
9. In Gauss Elimination which method is used to solve the values?
10. What is another name of Gamma function?

### SECTION –B (5 X 3 = 15 MARKS)

**ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3**

11. a) If A = $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, show that the products AA', A'A are symmetric but AA' $\neq$ A'A.

**(OR)**

b) If A and B are symmetric, then AB is symmetric if and only if A and B are commutative.

12. a) Solve the equation $x^3 - 12x^2 + 39x - 28 = 0$ whose roots are in A. P.

**(OR)**

b) Increase by 7 the roots of the equation $3x^4 + 7x^3 - 15x^2 + x - 2 = 0$.

13. a) Prove that $\log\frac{n+1}{n-1}=\frac{2n}{n^2+1}+\frac{1}{3}\left(\frac{2n}{n^2+1}\right)^3+\frac{1}{5}\left(\frac{2n}{n^2+1}\right)^5+\ldots\infty$.

**(OR)**

b) Show that $1+\left(\frac{1}{2}+\frac{1}{3}\right)\frac{1}{4}+\left(\frac{1}{4}+\frac{1}{5}\right)\frac{1}{4^2}+\left(\frac{1}{6}+\frac{1}{7}\right)\frac{1}{4^3}+\ldots\infty=\log\sqrt{12}$.

14. a) Solve the system of equations using Gauss elimination method:
10x + y + z = 12; 2x + 10y + z = 13; x + y + 5z = 7.

**(OR)**

b) Solve by Gauss Jordan method: 3x + 4 y +5 z = 18; 2x – y + 8z = 13; 5x – 2y + 7z = 20.

15. a) Prove that β (m, n) = β (m, n+1) + β (m+1, n).

**(OR)**

b) Evaluate $\int_0^1 (x\log x)^4\, dx$.

**SECTION –C (5X5 = 25 MARKS)**

**ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K4 & K5**

16. a) Show that the equation x + 2y – z = 3; 3x – y + 2 z = 1; 2x – 2y + 3z = 2; x – y + z = –1 are consistent and solve them.

**[OR]** **[K4]**

b) Show that the matrix $\frac{1}{3}\begin{bmatrix}-1 & 2 & 2\\ 2 & -1 & 2\\ 2 & 2 & -1\end{bmatrix}$ is orthogonal.

17. a) Solve the equation $x^4 - 2x^3 - 21x^2 + 22x + 40 = 0$ given that the roots are in A. P.

**[OR]** **[K5]**

b) Diminish the roots of $x^4 - x^3 - 10x^2 + 4x + 24 = 0$ by 2 and hence solve the original equations.

18. a) Show that $\frac{1}{1.2.3}+\frac{1}{3.4.5}+\frac{1}{5.6.7}+\ldots\infty=\log 2-\frac{1}{2}$.

**[OR]** **[K4]**

b) Sum to infinity the series $\frac{x}{1.2}+\frac{x^2}{2.3}+\frac{x^3}{3.4}+\ldots\infty$.

19. a) Solve the following system by Gauss elimination method.
5x + y + z + w = 4; x +7y + z + w = 12; x + y +6z + w = –5; x + y + z + 4w = –6.

**[OR]** **[K5]**

b) Solve the following system by Gauss Jordan elimination method.
x + y + z + w = 2; 2x – y + 2z – w = –5; 3x + 2y +3z +4 w = 7; x –2 y – 3z + 2w = 5.

20. a) Prove that $\Gamma(n+1)=\Gamma n$ .

**[OR]** **[K4]**

b) Prove that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$.

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