N.G.M COLLEGE (AUTONOMOUS): POLLACHI
END–OF –SEMESTER EXAMINATIONS: NOVEMBER 2023

COURSE NAME: B. SC PHYSICS   **MAX. MARKS: 75**
SEMESTER: I   **TIME: 3 HOURS**

MATHEMATICS FOR PHYSICS - I
SECTION – A   (10 X 1 =10 MARKS)
ANSWER THE FOLLOWING QUESTIONS: [K1]

1. All diagonal elements in a skew symmetric matrix is ------.
    a) one   b) infinity   c) same   d) zero
2. Every polynomial equation of nth degree has ------- roots.
    a) zero   b) one   c) n   d) infinity
3. 'e' is an **------** number.
    a) irrational   b) rational   c) finite   d) infinite
4. The aim of Gauss elimination method is to reduce the given matrix to -------.
    a) diagonal   b) identity   c) lower triangular   d) upper triangular
5. $\Gamma (n + 1) = $ --------
    a) n!   b) n   c) $n \Gamma (n)$ d) $n^2 \Gamma (n)$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES   [K2]

6. State Cayley Hamilton theorem.
7. Define reciprocal equation.
8. Expand log 2.
9. Name two methods of solving system of simultaneous linear equations.
10. Define Gamma function.

SECTION –B   (5 X 5 = 25 MARKS)
ANSWER ALL THE QUESTIONS: [K3]

11. a) Show that $\begin{bmatrix} \dfrac{1+i}{2} & \dfrac{-1+i}{2} \\ \dfrac{1+i}{2} & \dfrac{1-i}{2} \end{bmatrix}$ is unitary.

(OR)

b) Find the eigen values of $\begin{pmatrix} a & h & g \\ 0 & b & 0 \\ 0 & 0 & c \end{pmatrix}$.

12. a) Solve the equation $x^3 -19x^2+114 x -216 = 0$ given that the roots are in G.P.

(OR)

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

13. a) Find the sum to infinity of the series $\dfrac{4}{2.4} + \dfrac{4.5}{2.4.6} + \dfrac{4.5.6}{2.4.6.8} + ...\infty$.

(OR)

b) Sum to infinity the series $1+ \dfrac{1+2}{2!} + \dfrac{1+2+2^2}{3!} + ... \infty$

14. a) Solve the system by Gauss Elimination method: $2x + 3y - z = 5$, $4x + 4y - 3z = 3$ and $2x - 3y + 2z = 2$.

(OR)

   b) Solve the system by Gauss Jordan Elimination method: $x + 2y + z = 3$, $2x + 3y + 3z = 10$ and $3x - y + 2z = 13$.

15. a) Evaluate $\int\limits_{0}^{1} (x \log x)^4 \, dx$.

(OR)

   b) Evaluate $\int\limits_{0}^{\infty} e^{-x^2} \, dx$.

SECTION –C   **(5X8 = 40 MARKS)**

ANSWER ALL THE QUESTIONS:

16. a) Show that $\begin{bmatrix} 3i & 1+i \\ -1+i & -i \end{bmatrix}$ is a skew Hermitian matrix.

(OR) [K4]

   b) Obtain the characteristic roots and the associate characteristic vectors of the matrix

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

17. a) Find the equation whose roots are the roots of the equation $x^4 - x^3 - 10x^2 + 4x + 24 = 0$ by increased by 2 and hence solve the equation.

(OR) [K5]

   b) Remove the second term from the equation $x^3 - 6x^2 + 11x - 6 = 0$.

18. a) Sum to infinity the series $5 + \dfrac{2.6}{1!} + \dfrac{3.7}{2!} + \dfrac{4.8}{3!} + \ldots \infty$.

(OR) [K4]

   b) Sum to infinity the series $\dfrac{2.3}{3} + \dfrac{3.5}{5} + \dfrac{4.7}{7} + \ldots \infty$.

19. a) Apply Gauss Jordan method to find the solution of the following system: $10x + y + z = 12$, $2x + 10y + z = 13$, $x + y + 5z = 7$.

(OR) [K5]

   b) By Gauss Elimination method, find the inverse of $A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 2 & 0 \\ 3 & -1 & -4 \end{pmatrix}$.

20. a) Prove that $\Gamma\left(\dfrac{1}{2}\right) = \sqrt{\pi}$.

(OR) [K4]

   b) Evaluate $\int\limits_{0}^{\infty} \dfrac{x}{1+x^6} \, dx$.

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