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

22UPS1A1

Reg. No.

N.G.M COLLEGE (AUTONOMOUS): POLLACHI

END–OF –SEMESTER EXAMINATIONS: DECEMBER 2022

COURSE NAME: B. Sc.- PHYSICS **MAX. MARKS: 50**

SEMESTER: I **TIME: 3 HOURS**

ANCILLARY MATHEMATICS FOR PHYSICS – I

SECTION – A (10 X1 =10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. [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 value?
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 and B are Hermitian, show that AB + BA is Hermitian and AB – BA is skew Hermitian.

(OR)

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

12. a) Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ are in G.P.

(OR)

b) Solve the equation $6x^3 - 11x^2 + 6x - 1 = 0$ given that the roots are in H. P.

(CONTD…..2)

13. a) Find the sum to infinity of the series $1 + \frac{2}{6} + \frac{2.5}{6.12} + \frac{2.5.8}{6.12.18} + \ldots\infty$.

(OR)

b) Show that $\frac{3}{10}\left[\log e10 + \frac{1}{2^7} + \frac{1}{2}.\frac{3}{2^{14}} + \frac{1}{3}.\frac{3^2}{2^{21}} + \ldots\infty\right] = \log 2$.

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) Determine the characteristic roots of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & -1 \\ 2 & -1 & 0 \end{bmatrix}$.

[OR] [K4]

b) Use Cayley – Hamilton theorem to express $2A^5 – 3A^4 + A^2 – 4I$ as a linear polynomial in A when A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$.

17. a) Solve the equation $x^4 – 10x^3 – 120x^2 + 320x + 1024 = 0$ given that the roots are real and they from a G. P.

[OR] [K5]

b) Solve the equation $x^4 – 11x^2 + 2x + 12 = 0$ given that $\sqrt{5} – 1$ is a root.

18. a) Sum to infinity the series $1 + \frac{2^4}{2!} + \frac{3^4}{3!} + \frac{4^4}{4!} + \ldots.\infty$.

[OR] [K4]

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

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] [K5]

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

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