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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2022-2025 ONLY)

SUBJECT CODE 22UPS304

REG.NO. :

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

B.Sc. – PHYSICS **MAXIMUM MARKS: 50**
III SEMESTER **TIME : 3 HOURS**

PART – III

MATHEMATICAL PHYSICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(MULTIPLE CHOICE QUESTIONS) **(k1)**

1. The Gradient of a Scalar function is a --------.

   (a) tensor (b) vector (c) scalar (d) director

2. $(A^T)^T$ = -------.

   (a) A^2 (b) A (c) infinity (d) 1

3. The other name for Fourier-Mellin integral is ------- integral.

   (a) Bromwich (b) Laplace (c) Gauss's (d) Green's

4. The symmetry property of Beta function is β(m,n) = --------.

   (a) β(o,n) (b) β(o,m) (c) β(n,m) (d) β(m,m)

5. Iteration method is also called as the method of----------.

   (a) Regula Falsi (b) Euler's (c) Elimination (d) successive Pproximation

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. **(k2)**

6. For the Position Vector r = ix + jy + kz , Show that div r = 3.
7. What is the Conjugate of a Matrix?
8. State the two conditions for the transform of a function F(t) exists.
9. Write the two Dirichlet conditions.
10. Give the Iteration Formula of Newton-Raphson method

(CONTD ……. 2)

SECTION – B (5 x 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (k3)

11. (a) Define and explain about the Line Integral.

(OR)

(b) State and prove Stoke's Theorem.

12. (a) With an example, explain about the Symmetric and Anti-symmetric Matrices.

(OR)

(b) Find the rank of a (3x3) Matrix $\begin{pmatrix} 2 & 1 & -1 \\ 0 & 3 & -2 \\ 2 & 4 & -3 \end{pmatrix}$

13. (a) State and prove the Laplace transform's first and second translation property.

(OR)

(b) State and prove Convolution or FaltungTheorem.

14. (a) Get the Complex form of Fourier Series.

(OR)

(b) Obtain the relation between the Beta and Gamma functions.

15. (a) Solve for a Positive root of $x^3 - 4x + 1 = 0$ by Regula Falsi method.

(OR)

b) (i) Get the expression for Trapezoidal rule.

(ii) Evaluate $\int x^4 dx$ by using Trapezoidal Rule.

(CONTD …….3)

SECTION – C (5 x 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (k4/k5)

16. (a) Discuss about the (i) Gradient (ii) Divergence and (iii) Curl in Curvilinear Coordinates.

(OR)

(b) Write a note on (i) Gradient (ii) Divergence and (iii) Curl in Spherical Polar coordinates.

17. (a) Find the Eigen Values and Eigen Vectors of matrix

$$\begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$$

(OR)

(b) Find the Characteristic equation of matrix $\begin{pmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

And verify the Cayley – Hamilton Theorem.

18. (a) Find the Laplace Transform of

(i) sinh at (ii) cosh at (iii) sin at and (iv) cos at

(OR)

(b) Find the Inverse Laplace Transform of

(i) $1/(s^2 + a^2)$ (ii) $1/(s^2-a^2)$ and (iii) $1/(s + a)^2 + \omega^2$

19. (a). Find an Even function f(x) of x defined as

$f(x) = kx$ for $0 < x < 1/2$

$= k(l - x)$ for $1/2 < x < 1$.

(OR)

(b) Write a note on (i) Evaluation of Gamma function and (ii) Transformation of Gamma Function.

20. (a) Find the Positive Root of $x - \cos x = 0$ by Bisection method.

(OR)

b) Using Taylor's series method, find, correct to four decimal places, the value of $y(0.1)$, given $dy/dx = x^2 + y^2$ and $y(0) = 1$.