

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

END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022

B.Sc. – PHYSICS

MAXIMUM MARKS: 70

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 integral of a point function along a curve is called the _____ integral.
(a) volume (b) surface (c) line (d) area
2. The Rank of every zero or null matrix is
(a) unity (b) zero (c) infinity (d) -1
3. Laplace Transform of kt is
(a) $1/s^2$ (b) $1/s$ (c) k/s^2 (d) s^{-2}
4. A set of element of a group which itself forms is called
(a) abelian group (b) sub group (c) ordinary group (d) finite
5. In Euler's method, if we increase the number of intervals, cannot be obtained.
(a) accuracy (b) percentage (c) regulation (d) normalization

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

6. Define mathematically the Gradient of a Scalar Field..
7. What is the known as Conjugate of a Matrix?
8. Distinguish between the First and Second Shifting property of Laplace inverse transform.
9. What is Cyclic Group?.
10. Give "Trapezoidal Rule".

(CONTD.....2)

SECTION – B**(5 X 4 = 20 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)**

11. (a) Show that (i) $\text{div curl } A = 0$ and (ii) $\text{curl grad } \phi = 0$.

(OR)

- (b) State and prove Stokes's Theorem.
12. (a) Define Conjugate Transpose of a Matrix with an example. List its properties.

(OR)

- (b) Explain with an example the Hermitian and Skew- Hermitian Matrices.
13. (a) Find the Laplace Transform of (i) $\sin^2 t$ and (ii) $\cos^2 t$.

(OR)

- (b) State and prove Convolution Theorem.
14. (a) State Lagrange's Theorem for a Finite Group.

(OR)

- (b) Write a note on Isomorphism and Homomorphism.
15. (a) Find the positive Root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton- Raphson method, correct to five decimal places..

(OR)

- (b) Obtain the values of y at $x = 0.1, 0.2$ using Runge- Kutta second order method for the differential equation $dy/dt = -y$, given $y(0) = 1$

SECTION - C**(4 X 10 = 40 MARKS)****ANSWER ANY FOUR OUT OF SIX QUESTIONS****(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE****QUESTIONS (FROM Qn. No : 17 to 21)****(K4 (Or) K5)**

16. Find the Rank of matrices

$$(i) \quad A = \begin{pmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 2 & -2 & 3 \end{pmatrix} \quad (ii) \quad B = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 3 & -2 \\ 2 & 4 & -3 \end{pmatrix}$$

17. Get the Grad, Divergence and Curl in terms of Spherical Polar coordinates.

18. Find the Characteristic equation of matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{pmatrix}$

and verify the Cayley – Hamilton Theorem.

19. Find the Inverse Laplace Transform of

$$(i) 1/s(s^2 + w^2) \quad (ii) 1/s^2(s^2 + w^2) \quad (iii) 1/s^2(s^2 - w^2)$$

20. Explain about Conjugate Normal Subgroups and Factor groups.

21. (i) Give the theory of the Runge - Kutta second order method

- (ii) Solve: $e^x - 3x = 0$ by method of Iteration.