(FOR THE CANDIDATES ADMITTED IN 2025 ONWARDS) **(NO. OF PAGES: 02)**

25UCY2A2

N.G.M COLLEGE (AUTONOMOUS): POLLACHI
END–OF –SEMESTER EXAMINATIONS: APRIL 2026
B. Sc. CHEMISTRY **MAXIMUM MARKS: 75**
SEMESTER: II **TIME: 3 HOURS**

ANCILLARY MATHEMATICS FOR CHEMISTRY - II

SECTION – A **(10 X 1 =10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS:
MULTIPLE CHOICE QUESTIONS. **K1**

1. $1-\frac{\theta^2}{2!}+\frac{\theta^4}{4!}-\ldots$

a) $e^{i\theta}$ b) $e^{2\theta}$ c) $e^{-i\theta}$ d) $e^{-2\theta}$

2. $L^{-1}\left[\frac{1}{s}\right]=$ -------.

a) 0 b) –1 c) 2 d) 1

3. ∇C -----where C is a constant.

a) 0 b) -1 c) 1 d) ∞

4. If $\int \vec{F}.d\vec{r}$ to be independent is that of curl $\vec{F}$ = ------.

a) 1 b) 0 c) 2 d) 3

5. A scalar function is harmonic then $\nabla^2\phi$ =-------.

a) 0 b) 1 c) ∞ d) –1

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

6. Write the formula for sin hz.
7. Write the formula for $L^{-1}[\cos h\,at]$.
8. Define Solenoidal vector.
9. Define line integral.
10. State Gauss Divergence theorem.

SECTION – B (5X5=25 MARKS)

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

11. a) If tan $\frac{x}{2}$ = tan h $\frac{x}{2}$ show that cos x cos hx = 1.

[OR]

b) Separate into real and imaginary parts tan (x + iy).

12. a) Write shifting property.

[OR]

b) Find L{sin h at}.

13. a) Show that the vector $\overline{F}=3y^4z^2\bar{i}+4x^3z^2\bar{j}-3x^2y^2\bar{k}$ is solenoidal.

[OR]

b) Show that the vector $\overline{F}=(y^2-z^2+3yz-2x)\bar{i}+(3xz+2xy)\bar{j}+(3xy-2xz+2z)\bar{k}$ is irrotational.

14. a) Find the work done in moving a particle once around a circle C in the plane if the circle has centre at the origin and radius 2 units and if the force field is given by $\overline{F} = (2x - y + 2z)\bar{i} + (x + y - z^2)\bar{j} + (3x - 2y - 5z)\bar{k}$.

[OR]

b) Find the circulation of $\overline{F}$ round the curve C where $\overline{F} = y\bar{i} + z\bar{j} + x\bar{k}$ and C is the circle $x^2 + y^2 = 1, z = 0$.

15. a) Show that the area bounded by a closed curve C is given by $\frac{1}{2}\oint_c (xdy - ydx)$.

[OR]

b) Find the area of the four leafed rose r = 3 sin2θ.

SECTION – C (5X8=40 MARKS)

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

16. a) If sin (θ +i φ) = tan (x +i y) show that $\frac{\tan\theta}{\tanh\varphi} = \frac{\sin 2x}{\sinh 2y}$.

[OR]

b) If tan y = tan α tanh β, tan z = cot α tanh β, prove that tan (y +z) = sinh 2β cosec 2α.

17. a) Find the Laplace transform of the L{$\sin^3 2t$}.

[OR]

b) Find the Laplace transform of the L{$\sin^2 t \cos^3 t$ }.

18. a) Find the value of 'a' such that $\overline{F} = (axy - z^2)\bar{i} + (x^2 + 2yz)\bar{j} + (y^2 - axz)\bar{k}$ is irrorational.

[OR]

b) Prove that $\nabla.[\nabla r^n] = n(n+1)r^{n-2}$.

19. a) If $\overline{F} = 4xz\bar{i} - y^2\bar{j} + yz\bar{k}$, evaluate $\iint_s \overline{F}.\bar{n}\,ds$ where S is the surface of the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z =1.

[OR]

b) Evaluate $\iint_s \overline{F}.\bar{n}\,ds$ where $\overline{F} = yz\bar{i} + zx\bar{j} + xy\bar{k}$ and S is the part of the surface of the sphere $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

20. a) Verify Green's theorem in the plane for $\int_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region defined by y = $\sqrt{x}$ and y = x^2.

[OR]

b) Verify Green's theorem in the plane for $\int_c (xy + y^2)dx + x^2 dy$ where C is the chord curve of the region bounded by y = x and y = x^2.

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