

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

B.Sc.Chemistry - END SEMESTER EXAMINATIONS - NOV'2024

SEMESTER - I

20UCHAT1001 - Allied Mathematics - I

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

- Sum the series $\frac{1}{10} + \frac{1.4}{10.20} + \frac{1.4.7}{10.20.30} + \dots$
- Show that $\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \dots = 2\log 2 - 1$.
- Define symmetric and skew symmetric matrices. Also express the below matrix

as the sum of a symmetric matrix and a skew symmetric matrix $\begin{bmatrix} 2 & 4 & 8 \\ 6 & 2 & 8 \\ 2 & 2 & 2 \end{bmatrix}$.

- Determine the eigen values and eigen vectors of the matrix $\begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$.

- Show that

$$1) -2^5 \sin^6 \theta = \cos 6\theta - 6\cos 4\theta + 15 \cos 2\theta - 10.$$

$$2) -2^6 \sin^7 \theta = \sin 7\theta - 7\sin 5\theta + 21 \sin 3\theta - 35 \sin \theta.$$

- Express $\frac{\cos 7\theta}{\cos \theta}$ in terms of the following i) $\cos \theta$ ii) $\sin \theta$

- Given the following values for x and y

x	0	1	2	3	4	5
y	3	12	81	200	100	8

Find $\Delta^5 y_0$

- If $u = \log \tan \left(\frac{\pi}{4} + \frac{\alpha}{2} \right)$ then prove that the following

$$(i) \sinh u = \tan \alpha \quad (ii) \cosh u = \sec \alpha \quad (iii) \tanh u = \sin \alpha$$

Contd...

Section C

Answer any **THREE** questions ($3 \times 10 = 30$ Marks)

9. Sum the Series $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!}$.

10. Using Cayley – Hamilton theorem, Calculate A^4 given that $A = \begin{bmatrix} 2 & -2 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$.

11. Prove the following results:

(i) $\lim_{x \rightarrow 0} \frac{\sin 2x - 2\sin x}{x^3} = -1$.

(ii) $\lim_{x \rightarrow \pi/2} \frac{\sin x + \cos 2x}{\cos^2 x} = \frac{3}{2}$.

12. Use Newton's formula to find y when x = 142, given that

x	140	150	160	170	180
y	3.685	4.854	6.302	8.076	10.225

13. If $\tan(\theta + i\phi) = x + iy$, then Show that the following

i) $x^2 + y^2 + 2x \cot 2\theta = 1$

ii) $x^2 + y^2 - 2y \coth 2\phi = -1$
