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.AI - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - I
22UAIAT1001 - Allied Mathematics - I

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

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

1. Show that $\frac{1}{3!} + \frac{2}{5!} + \frac{3}{7!} + \frac{4}{9!} + ... = \frac{1}{2e}$
2. If the roots of $x^3 + px^2 + qx + \lambda = 0$ are in G.P., show that $\lambda p^3 = q^3$
3. Show that $-2^5\ sin^6\theta = cos6\theta$ - $6cos4\theta + 15cos2\theta$ - 10.
4. Find the maximum or minimum values of the function $f(x, y) = 2(x^2 - y^2)$ - $x^4 + y^4$.
5. Prove that the following matrix is unitary $\begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$.
6. Increase the roots of the equation $x^4 + 12x^3 + 56x^2 + 120x + 91 = 0$ by 3 and hence solve the equation.
7. If $tan\frac{x}{2} = tan\ h\frac{x}{2}$. show that $cos\ x\ cosh\ x = 1$.
8. Show that the radius of curvature at any point of the cardioids $r = a(1 + cos\theta)$ is $\frac{4a}{3}\ cos\ \frac{\theta}{2}$. Deduce that $\frac{\rho^2}{r}$ is a constant.

Section C

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

9. i) Given the following values for x and y

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

Find $\Delta^5 y_0$.

ii) Find the missing term from the following data

x	0	5	10	15	20	25
y	7	11	14	-	24	32

Contd...

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

11. If the sum of the two roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$ in equal to the sum of the other two, then prove that $p^3 + 8r = 4pq$.

12. If $tan(\theta + i\phi) = cos\alpha + isin\alpha$ then show that

    i) $\theta = \frac{n\pi}{2} + \frac{\pi}{4}$ ii) $\phi = \left(\frac{1}{2}\right) log\ tan\left[\left(\frac{\pi}{4}\right) + \left(\frac{\alpha}{2}\right)\right]$

13. If $y = sin(msin^{-1}x)$, then prove that

    i) (1 - x^2) y_2 - $xy_1 + m^2\ y = 0$.

    ii) (1 - x^2) y_{n+2} - $(2n + 1)xy_{n+1}$ - (n^2 - m^2)$y_n = 0$.

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