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.DS - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - I
22UDSAT1001 - 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 $\dfrac{1+\dfrac{1}{2!}+\dfrac{2}{3!}+\dfrac{2^2}{4!}+...}{1+\dfrac{1}{2!}+\dfrac{1}{4!}+\dfrac{1}{6!}+...} = \dfrac{e}{2}$
2. Solve $x^4 + 2x^3$ - $5x^2 + 6x + 2 = 0$, given that 1 + i is a root.
3. Show that $2^5 cos^6\theta = cos6\theta + 6cos4\theta + 15cos2\theta + 10$.
4. Find the maximum and minimum values of the function $f(x, y) = x^2y^2$ - x^2 - y^2.
5. Show that the matrix $\dfrac{1}{3}\begin{bmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ 1 & -2 & 2 \end{bmatrix}$ is orthogonal.
6. Diminish the roots of the equation x^4 - $4x^3$ - $7x^2 + 22x + 24 = 0$ by 1 and hence solve the equation.
7. If $tan^{-1}(2 - i) = x + iy$, then show that $4y = -log2$.
8. Show that the radius of curvature at any point of the cardioids $r = a(1 + cos\theta)$ is $\dfrac{4a}{3}\, Cos\dfrac{\theta}{2}$. Deduce that $\dfrac{\rho^2}{r}$ 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) Apply Newton's backward difference formula to find a polynomial of degree 3, for the following data

x	3	4	5	6
y	6	24	60	120

Contd...

10. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$.

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

12. If sin(A + iB) = x + iy, then
    i) show that $x = sinA\ coshB$,
    ii) show that $\frac{x^2}{Sin^2A} - \frac{y^2}{cos^2A} = 1$,
    iii) show that $\frac{x^2}{cosh^2B} + \frac{y^2}{sinh^2B} = 1$

13. If $y = sin^{-1}x$, prove that
    i) (1 - x^2)y_2 - $xy_1 = 0$
    ii) (1 - x^2)y_{n+2} - $(2n+1)xy_{n+1}$ - $n^2y_n = 0$.

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