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. END SEMESTER EXAMINATIONS APRIL-2022
SEMESTER - II
21UCGAT2002 - Numerical Methods

Total Duration : 3 Hrs. **Total Marks : 60**

Section A

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

1. Explain the geometrical interpretation of bisection method for finding the root of algebraic equation $f(x)$=0.
2. Prove the following
   $\mathrm{E} = 1+\triangle$
   $\bigtriangledown = 1 - \mathrm{E}^{-1}$
   $\delta = \mathrm{E}^{\frac{1}{2}} - \mathrm{E}^{-\frac{1}{2}}$
3. Using Newton's divided difference formula, find the value of $f(8)$ given the following table :

X	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

4. Find $\frac{dy}{dx}$at $x = 51$ from the following data

X	50	60	70	80	90
Y	19.96	36.65	58.81	77.21	94.61

5. Solve $\frac{dy}{dx} = x + y$, given $y(1) = 0$, and get $y(1.1)$, by Taylor's series method.
6. Using Newton's method, find the root lies between 0 and 1 of $x^3 = 6x$ - 4 correct to 3 places of decimals.
7. Solve $\frac{dy}{dx}$ = 1 - y ,$y(0)$=1 using Euler's method. Find y at x=0.1 and x=0.2. Compare the result with results of the exact solution.
8. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with h=0.2.

Section B

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

9. Solve for a positive root of x^3 - 4x+1=0 by Regula False method

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10. The population of a town is as follows.

Year X	1941	1951	1961	1971	1981	1991
Population in lakhs	20	24	29	36	46	51

Estimate the population increase during 1946 to 1976 , using Newton's interpolation formula

11. Use Lagrange's formula to fit a polynomial to the data

X	-1	0	2	3
y	-8	3	1	12

12. Evaluate $\int_0^1 \frac{dx}{1+x}$, using
    i. Trapezoidel rule.
    ii. Simpson's one third rule.
    iii. Simpson's three eight rule.
    iv. Find the error in each method by comparing with the actual integration upto 4 places of decimals.
13. Using Runge-Kutta method of fourth order find $y(0.1)$,$y(0.2)$ and $y(0.3)$, given that $\frac{dy}{dx} = 1 + xy$; $y(0) = 2$.

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