PARUL UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF APPLIED SCIENCE AND HUMANITIES
4th SEMESTER B. TECH PROGRAMME
PROBABILITY, STATISTICS AND NUMERICAL METHODS (303191251)

Tutorial : Numerical Integration

Q.1 Evaluate $\int_0^1 e^{-x^2}\,dx$ by Trapezoidal rule with n=10.

Q.2 Evaluate $\int_0^3 \frac{dx}{1+x}$ with n=6 by using Simpson's $\frac{3}{8}$ rule and hence calculate log2.

Q.3 Consider following tabular values. Determine the area bounded by the given curve & X-axis between x=25 to x=25.6 by Trapezoidal rule.

x	25	25.1	25.2	25.3	25.4	25.5	25.6
y	3.205	3.217	3.232	3.245	3.256	3.268	3.280

Q.4 Find $\int_{10}^{16} y\,dx$ by Simpson's 1/3 rule.

x	10	11	12	13	14	15	16
y	1.02	0.94	0.89	0.79	0.71	0.62	0.55

Q.5 Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x)dx$ with $n = 6$, using (a) Simpson's 1/3rd rule (b) Simpson's 3/8th rule.

Q.6 Using Gaussian two point formula compute $\int_0^{\Pi} \sin x dx$

Q.7 A river is 80 meters wide. The depth 'd' in meters at a distance x meters from one bank is given by the following table calculate the area of cross-section of the river using Simpson's1/3 rule.

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

Q.8 Evaluate $\int_0^1 \frac{dt}{1+t}$ by the Gaussian formula with one point, two points.

Q.9 Evaluate the integral $\int_{-2}^{6} (1+x^2)^{3/2}\,dx$ by Simpson's 1/3 rule with 6 subintervals.

Numerical Solution of Ordinary Differential Equation

1	Solve $\frac{dy}{dx} = 3 + 2xy$, where y(0)=1 for x=0.1 by Taylor's series method.
2	Using Taylor's series method solve $\frac{dy}{dx} = x^2 - y, y(0) = 1$ at 0.1 ≤ x ≤ 0.4. Compare the values with the exact solution.
3	Using Modified Euler's method, solve $\frac{dy}{dx} + 2xy^2 = 0$ with the initial condition $y(0) = 1$ and compute $y(1)$ taking h=0.2. Compare the answer with exact solution.
4	Using Runge – Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, \quad y(0) = 1$ at x = 0.2 & 0.4.
5	Apply Runge – Kutta method to find an approximate value of y when x = 0.2 with h = 0.1 for the IVP $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$. Also find the Analytical solution and compare with the numerical solution.
6	Using Euler's method to find y(1.4) given that $\frac{dy}{dx} = xy^{\frac{1}{2}}$, y(1)=1.
7	Use Runge-Kutta Second order method to find the approximate value of y(0.2) given that $\frac{dy}{dx} = x - y^2$ and y(0)=1 and h=0.1
8	Using Runge – Kutta method, find an approximate value of y for x = 0.2 in steps of 0.1 if $\frac{dy}{dx} = x + y^2$, given that y = 1 when x = 0,
9	Solve $\frac{dy}{dx} = \log(x + y)$, y(0)=2 at x=1.2 and x=1.4 with h=0.2, by Euler's modified method: