## Numerical method

### Unit − 2 & 3 (Report)

1. Find the square root of 2.5 using second order Lagrange interpolation polynomial using the following data table:

| $x$ | 1 | 2 | 3 | 4 | |
|------|------|--------|--------|------|--------|
| $f(x)$ | 1 | 1.4142 | 1.7321 | 2 | 2.2361 |

2. Given the data points :

| i | 0 | 1 | 2 |
|-------|---|---|----|
| $x_i$ | 2 | 3 | 4 |
| $f_i$ | 4 | 9 | 16 |

Estimate the function value of $f$ at $x = 2.5$ using cubic splines.

3. From the following data:

| $x$ | 0 | 1 | 2 | 3 | 4 |
|-----|-----|-----|-----|-----|-----|
| $y$ | 1.5 | 2.5 | 3.5 | 5.0 | 7.5 |

i) Fit a power function model of the form $y = ax^b$

ii) Fit the curve of the form $y = ax + b$.

4. From the following table find the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the point $x = 1.0$

| $x$ | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 |
|-----|--------|--------|--------|--------|--------|--------|
| $y$ | 5.4680 | 5.6665 | 5.9264 | 6.2551 | 6.6601 | 7.1488 |

5. Evaluate  a) $\int_0^6 \left(\frac{1}{1+x^2}\right) dx$      b) $\int_0^{\left(\frac{\pi}{2}\right)} sinx \ dx$  by using

i) Trapezoidal rule   ii) Simpson's $\frac{1}{3}$ rule  iii) Simpson's $\left(\frac{3}{8}\right)$ rule.

6. Use Romberg's method to compute $\int_0^1 \left(\frac{1}{1+x^2}\right) dx$ , with  $h = 0.25$ correct to three decimal place.