

**CSE 330: Summer 2024**  
**Assignment-2 [CO3]**  
**Total Marks: 25**

1. Consider the following table of data points/nodal points:

Time t (sec)	Velocity (ms <sup>-1</sup> ) v(t)
2	10
4	20
6	25

- a. [4+1 marks] Find an interpolating polynomial of velocity that goes through the above data points by using **Vandermonde Matrix** method. Also compute an approximate value of acceleration at Time, **t=7 sec**.
- b. [4 marks] Find an interpolating polynomial of velocity that goes through the above data points by using **Lagrange** method.
- c. [2 marks] If a **new data point** is added in the above scenario, which method should you use in finding a new interpolating polynomial? Also what will be the degree of that new polynomial?

2. Read the following and answer accordingly:

- a. (4 marks) Consider the nodes  $[-\pi/2, 0, \pi/2]$ . Find an interpolating polynomial of appropriate degree by using **Newton's divided-difference** method for  **$f(x) = x \sin(x)$** .
- b. (2 marks) Use the interpolating polynomial to find an approximate value at  $\pi/4$ , and compute the percentage relative error at  $\pi/4$ .
- c. (4 marks) Add a new node  $\pi$  to the above nodes, and find the interpolating polynomial of appropriate degree.

3. Consider the quadratic equation,  $2x^2 - 60x + 3 = 0$ . Below calculate **up to 6 significant** figures.

- a. (3 marks) Find out where the loss of significance occurs when you calculate the roots?
- b. (3 marks) Show that the roots evaluated in the previous part do not satisfy the

fundamental properties of a polynomial.