HASMUKH GOSWAMI COLLEGE OF ENGINEERING, VAHELAL

APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERING (3130908)

TUTORIAL 2: Interpolation

1. Prove that **(i)** $\nabla = 1 - E^{-1}$ **(ii)** $E = 1 + \Delta$ **(iii)** $¢ = E^{-\frac{1}{2}}\Delta$ **(iv)** $(1+\Delta)(1-\nabla) = 1$ **(v)** $\Delta = 1 - e^{hD}$

(vi) $« = E^{-\frac{1}{2}}\left(\frac{\Delta}{2}+1\right)$ **(vii)** $¢ = E^{\frac{1}{2}}\nabla$

2. Write down forward difference table

X	1	3	5	7	9
y	8	12	21	36	62

Find the value of $\Delta f(5), \Delta^2 f(3), \Delta^3 f(1)$

3. Use Newton's Forward difference method to find the approximate value of $f(2.3)$ from the following data

x	2	4	6	8
F(x)	4.2	8.2	12.2	16.2

4. Explain quadratic Langrage's interpolation. Compute $f(2)$ by using Langrage interpolation method from the following data

x	-1	0	1	3
F(x)	2	1	0	-1

5. Write a formula for divided difference $f[x_0, x_1]$ and $f[x_0, x_1, x_2]$. Compute $f(9.5)$ by using Newton's divided difference interpolation method from the following data

x	8	9	9.2	11
F(x)	2.079442	2.197225	2.219203	2.397895

6. Evaluate $f(9.2)$ by using Langrage's interpolation method from the following data

x	9	9.5	11
F(x)	2.1972	2.2513	2.3979

7. Use Newton's Forward difference method to find the approximate value of $f(1.3)$ from the following data

x	1	2	3	4
F(x)	1.1	4.2	9.3	16.4

8. Compute $f(10.5)$ by using Newton's divided difference interpolation method from the following data

x	10	11	13	17
F(x)	2.3026	2.3979	2.5649	2.8332

9. The shear stress in kips, per square foot (ksf) for 5 specimens in a clay stratum are

Depth(m)	1.9	3.1	4.2	5.1	5.8
Stress(ksf)	0.3	0.6	0.4	0.9	0.7

Compute the stress at 4.5 m depth.

10. Evaluate $f(4)$ by using Langrage's interpolation method from the following data

x	2	3	5	7
F(x)	0.1506	0.3001	0.4517	0.6259

11. Let $f(40) = 836$, $f(50) = 682$, $f(60) = 436$, $f(70) = 272$ .Use Stirling's formula to find $f(55)$.

12. Write $f(x) = x^4 - 2x^3 + x^2 - 2x + 1$ in factorial notation, Find $\Delta^4 f(x)$.

13. Determine the polynomial by Newton's Forward difference method from the following data.

x	0	1	2	3	4	5
y	-10	-8	-8	-4	10	40

14. Consider following tabular values and determine $y(300)$.

x	50	100	150	200	250
y	618	724	805	906	1032

15. Evaluate $y(12)$ by using Langrage's interpolation method from the following data

x	11	13	14	18	20	23
y	25	47	68	82	102	124

16. Compute $f(8)$ by using Newton's divided difference interpolation method from the following data

x	4	5	7	10	11	13
F(x)	48	100	244	900	1210	2028

17. Using Langrage's interpolation method to fit a polynomial to the following data

x	-1	0	2	3
y	8	3	1	12

and hence find $y(2)$.

18. Find the value of $\sin 52^\circ$ from the following data

$^\circ$	45°	50°	55°	60°
$\sin^\circ$	0.7071	0.7660	0.8192	0.8660

19. Find $f(x)$ by using Newton's divided difference interpolation method from the following data

x	1	2	7	8
F(x)	1	5	5	4

20. Employ Stirling's interpolation method to find $y(35)$ from the following data

x	20	30	40	50
y	512	439	346	243

21. Use Newton's Forward difference method to find the approximate value of $f(1.6)$ from the following data

x	1	1.4	1.8	2.2
F(x)	3.49	4.82	5.96	6.5

22. Compute $\cosh(0.56)$ from the following table and estimate the error.

x	0.5	0.6	0.7	0.8
$\cosh(x)$	1.127626	1.185465	1.255169	1.337435