

MAS 201 Engineering Mathematics III: B. Tech. (Third Semester)-2018-19
Assignment-1 (Unit-2) Numerical Techniques-1

- (16). Prove that (i) $\Delta = \frac{1}{2} \Delta^2 + \Delta \sqrt{1 + \frac{\Delta^2}{4}}$ (ii) $\frac{1}{2} - \frac{1}{2} = \Delta + \nabla$ (iii) $\mu \delta = \frac{1}{2}(\Delta + \nabla)$
- (17). Find the real root of $x^2 - x - 1$ (between 1 and 2) by fraction method.
- (18). Find rate of convergence of Regula-Fabi method and root of equation $x \cos x + \cos x - 1 = 0$ using same method.
- (19). Find real root of the following equation correct to three decimal places using Newton-Raphson method $x \log_e x = 1.2$
- (20). Find a positive real root of equation $5x - \cos x - 1 = 0$ using the method of false position. Prove that
- (i) $\mu \delta = \frac{1}{2}(\Delta + \nabla)$ (ii) $\mu^2 = \left(\frac{\Delta}{\nabla}\right) \cdot \frac{\nabla}{\Delta}$ (iii) $\Delta = \frac{1}{2} \Delta^2 + \Delta \sqrt{1 + \frac{\Delta^2}{4}}$ (iv) $\frac{1}{2} - \frac{1}{2} = \Delta + \nabla$
- (21). Find the missing term in the following table.

(a)

| | | | | | | | |
|--------|---|-----|----|-----|---|-----|---|
| x | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
| $f(x)$ | 6 | — | 10 | 20 | — | 15 | 3 |

(b)

| | | | | | | | |
|--------|---|----|-----|---|------|------|------|
| x | 2 | 4 | 6 | 8 | 10 | 12 | 14 |
| $f(x)$ | 8 | 64 | 216 | — | 1000 | 1728 | 2744 |

- (7). Given the table, estimate the number of students who obtained marks between 80 and 85.
 Marks : 30-40 40-50 50-60 60-70 70-80
 No. of students: 30 42 50 65 90

- (8). Estimate the value of $f(27)$ and $f(42)$ from the following table:

| | | | | | | |
|--------|-----|-----|-----|-----|-----|-----|
| x | 20 | 25 | 30 | 35 | 40 | 45 |
| $f(x)$ | 154 | 152 | 291 | 260 | 210 | 204 |

- (9). Fit a polynomial of degree 3 and hence determine $y(3.5)$ for the following data, using forward interpolation:

| | | | | |
|--------|---|----|----|-----|
| x | 3 | 4 | 5 | 6 |
| $f(x)$ | 6 | 24 | 60 | 120 |

- (10). Fit a cubic polynomial which takes the following values: $y(0) = 1$, $y(1) = 0$, $y(2) = 1$, $y(3) = 10$, and also find the value of $y(4)$.

- (11). By means of Lagrange's formula, prove that $y_1 = y_0 + 0.3(y_1 - y_0) + 0.2(y_2 - y_0)$.

- (12). Using Lagrange's interpolation formula, find $f(1.6)$ from the following table:

| | | | | |
|--------|----|----|----|----|
| x | 2 | 6 | 9 | 11 |
| $f(x)$ | 12 | 13 | 14 | 16 |

- (13). Using Newton's divided difference interpolation formula, find a polynomial function satisfying the following data and also find the value of $f(3)$.

| | | | | | |
|--------|------|----|---|---|------|
| x | -4 | -1 | 0 | 2 | 5 |
| $f(x)$ | 1245 | 33 | 5 | 9 | 1135 |