

Dr. Babasaheb Ambedkar Technological University, Lonere Raigad
Mid Semester Examination – October - 2017

Branch: M. Tech. (Mechanical Engg)

Sem. : I

Subject with subject code:
 Numerical methods and Computational Techniques
 (MTE1103/MTF1103/MHP1103/MTH1103)

Marks: 20

Date:

Time:

SOLUTION

Q. 1 Attempt any ONE of the following: (08)

- (a) $f(t) = (70 \cdot \exp(-1.5 \cdot t)) + (25 \cdot \exp(-0.075 \cdot t)) - 9.0$
 $\text{devf}(t) = (-105 \cdot \exp(-1.5 \cdot t)) + (-1.875 \cdot \exp(-0.075 \cdot t))$
 $t = t_0 - f(t) / \text{devf}(t)$
 $dt_0 = ((t - t_0) / t) \cdot 100.0$

The solution is converged and the value of the t is 13.62201 with error $dt_0 = 6.2007673E-02$

- (b)
$$f(c) = \frac{gm}{c} \left(1 - e^{-(c/m)t} \right) - v$$

$c_l = 12$ and $c_u = 16$ as function changes sign -ve to +ve and converges at sixth iteration with the root ie $c = 14.75$ and error is less than 0.5%

Q. 2 Attempt any THREE of the following: (12)

- (c) The density of a cube is measured by measuring its mass and the length of its sides. If the maximum errors in the measurement of mass and length are 3% and 2% respectively, find the maximum error in the measurement of density.

$$\rho = \frac{m}{L^3}$$

$$\frac{\Delta \rho}{\rho} = \frac{\Delta m}{m} + 3 \frac{\Delta L}{L} = 0.03 + 3 \times 0.02 = 0.09 = 9\%$$

- (d) Evaluate the sum $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to 4 significant digits and find its absolute and relative error.

$$\sqrt{3} = 1.732, \sqrt{5} = 2.236, \sqrt{7} = 2.646$$

$$S = 6.614$$

$$\text{error} = 0.0005 + 0.0005 + 0.0005 = 0.0015$$

$$\text{max error} = \frac{0.001}{2} = 0.0005 < 0.0015$$

so correct significant no is three ie 6.61 and relative error is $0.0015 / 6.61 = 0.0002$.