

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL  
UNIVERSITY, LONERE - RAIGAD -402 103  
Winter Semester Examination - Dec - 2019**

**Branch:** Mechanical Engineering

**Subject:-** Numerical Methods in Mechanical Engineering (BTMEC404)

**Date:-** 02/12/2019

**Sem.:-** IV

**Marks:** 60

**Time:-** 3 Hr.

**Instructions to the Students**

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

**(Marks)**

**Q.1. (a)** Explain the following; Approximate error, Precision and accuracy with suitable example? **(6)**

**(b) (i)** The length and breadth of a rectangle are A body travels uniformly a distance of  $(5.7 \pm 0.1)$  cm and  $(3.4 \pm 0.2)$  cm. Find the area of the rectangle with in error limit. **(4)**

**(ii)** Round off the following to four significant digits. **(2)**  
 $0.0063945, 0.090038$

**Q.2.** Find the positive root of the equation  $xe^x = 1$  using bisection method which lies between 0 and 1 till approximate error becomes 10%. Show lower limit, upper limit and approximate error in each iteration. **(12)**

**Q.3.** Use Gauss elimination to solve **(12)**

$$\begin{aligned} 3x_1 - 0.1x_2 - 0.2x_3 &= 7.85 \\ 0.1x_1 + 7x_2 - 0.3x_3 &= -19.3 \\ 0.3x_1 - 0.2x_2 + 10x_3 &= 71.4 \end{aligned}$$

**Q.4. (a)** The work done on an object is equal to the force times the distance moved in the direction of the force. The velocity of an object in the direction of a force is given by

$$v = 4t \quad 0 \leq t \leq 6$$

where  $v$  is in m/s. Employ the multiple application trapezoidal rule to determine the work if a constant force of 200 N is applied for all  $t$ . **(8)**

**(b)** Obtain the forward Difference expression for first derivatives. **(4)**

**Q.5.**

**(a)** Solve the following ODE using Euler's method from  $t = 0$  to 3 taking step size of 1.

$$\frac{dy}{dt} = -y + t$$

given  $y(0) = 1$

**(6)**

- (b) The table below gives the temperature  $T$  ( $^{\circ}\text{C}$ ) and length  $l$  (mm) of a heated rod. Find the values of length at  $55^{\circ}\text{C}$  using quadric interpolation. (6)

$T$	40	50	60
$l$	600.5	600.6	600.8

- Q.6. Draw the algorithm of the following Numerical Methods (Any Two). (12)
- (i) NR Method
  - (ii) Simple Trapezoidal Rule
  - (iii)  $1/3^{\text{rd}}$  Simpson Rule

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Paper End