Roll No:_____

22-3-2018

DOON UNIVERSITY, DEHRADUN
Department of Mathematics, School of Physical Sciences
Mid Semester Examination, Even Semester 2017-18

Class : Int. M.Sc. Mathematics | **Semester : IV**
Course: Numerical Methods | **Course Code: MAC-251**
Time Allowed : 2 Hours | **Max Marks : 30**

Note: Attempt all **Six** questions in Section A. Each question carries **1** marks.
Attempt any **Four** questions in Section B. Each question carries **3** marks.
Attempt any **Two** questions in Section C. Each question carries **6** marks.

Section: A
(Short Answer Type Questions)

Attempt all Six questions. **[6×1 = 6 Marks]**

1. Define the terms: (a) Pivoting (b) Rate of convergence of a method.
2. Find the difference of $\sqrt{2.01} - \sqrt{2}$ correct to three digits.
3. If $y = 4x^5 - 3x$, find the percentage error in y if $x = 1$ and error in x is 0.05.
4. What is the difference between open and bracketing methods which are used to solve algebraic and transcendental equations?
5. Find the minimum number of iterations required to perform Bisection method for converging to a root of the problem $f(x) = 0$ in the interval $(1, 3)$ for $\epsilon = 0.001$.
6. What is condition number?

Section: B
(Short Answer Type Questions)

Attempt any Four questions. **[4×3 = 12 Marks]**

7. Given the solution of a problem as $x_a = 35.25$ with the relative error in the solution at most 2%. Find, to four decimal digits, the range of values within which the exact value of solution must lie.
8. Evaluate $f(x) = x^3 - 6.1x^2 + 3.2x + 1.5$ at $x = 4.71$ using three-digit(chopping) arithmetic.
9. Use fixed point method to solve the equation $3x + \sin x = e^x$ correct upto four decimal places in the interval $(0, 1)$.
10. Find the root of the equation $x^4 - 2x^3 - 4x^2 + 4x + 4 = 0$ correct upto four decimal places in the range [2, 3] using Secant method.
11. Apply Gauss-Elimination method with partial pivoting to solve the equations

$$\begin{aligned} 2x + y + z &= 10 \\ 3x + 2y + 3z &= 18 \\ x + 4y + 9z &= 16. \end{aligned}$$

Section: C

(Long Answer Type Questions)

Attempt any Two questions. **[2×6 = 12 Marks]**

12. (a) Round off the following numbers, to four significant digits and then calculate absolute, relative and percentage errors: (i) 19.36235 (ii) 54762.

    (b) Use Regula-falsi method to solve the equation $4e^{-x}\sin x - 1 = 0$ correct upto three decimal places in the interval $(0, 0.5)$.

13. (a) Develop the formula for Newton Raphson method.

    (b) Show that the rate of convergence of Newton Raphson method is 2.

14. Apply Gauss-Jordan method to solve the equations

$$\begin{aligned} x + 2y + 3z - w &= 10 \\ 2x + 3y - 3z - w &= 1 \\ 2x - y + 2z + 3w &= 7 \\ 3x + 2y - 4z + 3w &= 2. \end{aligned}$$