



21-3-17

DOON UNIVERSITY, DEHRADUN
Mid Semester Examination, First Semester, 2015
School of Physical Sciences

Class: Int. M.Sc. Mathematics
Semester: IV

Course: Numerical Methods
Course Code: MAC-251

Time Allowed: 2Hours

Maximum Marks: 30

Note: Attempt all six questions in Section A. Each question carries one 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
(Very Short Answer Type Questions)

(Marks:6X1=6)

1. Given $x = 1.2, y = 25.6$ and $z = 4.5$ then the relative error in evaluating $w = x^2 + y/z$ is....
2. Find the absolute error if the number $x = 0.00545828$ is truncated to three decimal digits.
3. Suggest a value of constant k , so that the iteration formula $x = x + k(x^2 - 5)$ may converge at a good rate, given that $x = \sqrt{5}$ is a root.
4. What is the rate of convergence of a method?
5. What is ill-conditioned system?
6. What is partial pivoting in the solution of linear simultaneous equations?

SECTION: B
(Short Answer Type Questions)

(Marks: 4X3=12)

7. Find the relative error in the function $y = ax_1^{m_1} x_2^{m_2} \dots x_n^{m_n}$.
8. Using the Bisection method, find the approximate root of the equation $\sin x = 1/x$ in the interval $(1, 1.5)$. Carry out computations upto 5th stage.
9. Find the cube root of 29 using Newton Raphson's method correct to four decimal places.
10. If $\phi(x)$ is a continuous function in some interval $[a, b]$ that contains the root and $|\phi'(x)| \leq c < 1$ in the interval, then for any choice of $x_0 \in [a, b]$, the sequence $\langle x_n \rangle$ of iterates determined from $x_{k+1} = \phi(x_k)$, $k = 0, 1, 2, \dots$ converges to the root ξ of $x = \phi(x)$.
11. Using Doolittle's method, solve the following system.

$$\begin{aligned} 28x + 4y - z &= 32 \\ x + 3y + 10z &= 24 \\ 2x + 17y + 4z &= 35. \end{aligned}$$

SECTION: C
(Long Answer Type Questions)

(Marks: 2X6=12)

12. (a) Find a real root of the equation $x \log_{10} x = 1.2$ using Regula-False method correct upto four decimal places.

(b) Use the series $\log_e \left(\frac{1+x}{1-x} \right) = 2 \left(x + \frac{x^3}{3} + \frac{x^5}{5} + \dots \right)$ to compute the value of $\log 1.2$ correct to seven decimal places and find the number of terms retained.

13. (a) Develop the formula for Secant method.

(b) Find a real root of the equation $x^3 + 4x^2 - 10 = 0$ in the interval $[1, 2]$ correct to four decimal places using Fixed point method.

14. Solve the following system of equations by Gauss-Elimination method.

$$10x - 7y + 3z + 5w = 6$$

$$-6x + 8y - z - 4w = 5$$

$$3x + y + 4z + 11w = 2$$

$$5x - 9y - 2z + 4w = 7$$