

27/5/24



DOON UNIVERSITY, DEHRADUN
End Semester Examination, IV Semester, 2024
 Academic Year 2023-24 (Even Semester)
 School of Physical Sciences Department of Mathematics
 Programme: BSc Mathematics
 Course Code with Title: MAG 251: Numerical Methods. (Generic)

Time Allowed 2 Hours

Maximum Marks: 50

1. All questions are compulsory.
2. Use of Scientific calculator is allowed.

SECTION: A [5x3=15M]

Q1. Find the root of the equation $\cos x = xe^x$ using bisection method correct to three decimal places

Q2. Prove that $\left(E^{\frac{1}{2}} + \frac{1}{E^{\frac{1}{2}}}\right) (1 + \Delta)^{\frac{1}{2}} = 2 + \Delta$

Q3. Show that the divided differences are symmetrical in their arguments.

Q4. Under what conditions the Stirling's and Bessel's interpolation formulas gives best estimates.

Q5. Find the real root of the equation $\cos x = 3x - 1$ correct to 2 decimal places using iteration method.

SECTION: B [3x5=15M]

Q6. Given $\frac{dy}{dx} = x - y^2$, $y(0.2) = 0.02$. Find $y(0.4)$ by modified Euler's method correct to 3 decimal places, taking $h = 0.2$.

Q7. Using Lagrange's interpolation formula find $y(10)$ from the following table

x	5	6	9	11
$f(x)$	12	13	14	16

Q8. Find by Newton Raphson method, the real root of equation $3x = \cos x + 1$ correct to four decimal places.

OR

Find a real root of the equation $x = e^{-x}$ using the Newton-Raphson method correct to four decimal places.

P.T.O.

SECTION: C [2x10=20M]

Q9. Solve the equation

$$\begin{aligned}27x + 6y - z &= 85, \\x + y + 54z &= 110, \\6x + 15y + 2z &= 72\end{aligned}$$

using Gauss-Seidel method correct to three decimal places

OR

Solve by Jacobi's iteration method correct to two decimal places

$$\begin{aligned}10x + y - z &= 11.19 \\x + 10y + z &= 28.08 \\-x + y + 10z &= 35.61\end{aligned}$$

Q10 Solve the equation $\frac{dy}{dx} = x + y$ with initial condition $y(0) = 1$ by Runge-Kutta from $x = 0$ to $x = 0.2$, $h = 0.1$