17779

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – M.Tech.(RA)-2024
Course Name – MOOC-Matlab Programming for Numerical Computation
Course Code - MEC20303C
(Semester II)

Full Marks : 70 **Time : 3:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Select the term that best describes how close a measured value is to the true value.
a) Precision b) Accuracy
c) Error d) Propagation

(ii) Choose the characteristic of a system where repeated measurements yield very similar results.
a) Accuracy b) Precision
c) Truncation Error d) Round-off Error

(iii) Identify the type of error caused by representing a number with limited digits.
a) Truncation Error b) Round-off Error
c) Systematic Error d) Propagation Error

(iv) Select the source of truncation error in numerical computation.
a) Rounding b) Approximation
c) Measurement d) Conversion

(v) Choose the property that best defines precision.
a) Closeness to true value b) Consistency of repeated measurements
c) Randomness in results d) Deviation from expected results

(vi) Select the value that represents an eigenvalue of a matrix.
a) Scalar b) Vector
c) Matrix d) Determinant

(vii) Choose the process for finding eigenvalues of a matrix.
a) LU Decomposition b) Solving characteristic equation

c) Matrix Inversion
d) Gauss Elimination

(viii) Choose the correct interpretation of eigenvectors.

a) Scalars of matrix
b) Directions of transformation
c) Row sums of matrix
d) Diagonal elements

(ix) Employ the most efficient open method for solving nonlinear equations.

a) Bisection method
b) Newton-Raphson method
c) Regula Falsi method
d) Fixed-point iteration

(x) Apply the Secant method to find roots. What is the key advantage?

a) No need for function values
b) Faster convergence than bisection
c) Works with discontinuous functions
d) Uses fixed intervals

(xi) Employ the multivariate Newton's method. What does it require?

a) Single variable function
b) Gradient and Jacobian matrix
c) No derivatives
d) Only one initial guess

(xii) Justify the choice of MATLAB for implementing Newton's Difference Formulae.

a) Built-in support
b) Speed of computation
c) Accuracy
d) All of the above

(xiii) Explain the use of size() function helps in?

a) Determining array shape
b) Changing array shape
c) Sorting an array
d) Transposing an array

(xiv) Examine the following code: A = [1 2; 3 4]; B = A'. What does B represent?

a) Inverse of A
b) Transpose of A
c) Determinant of A
d) Square of A

(xv) Determine in the context of numerical methods, the term "convergence" refers to:

a) The speed at which an algorithm finishes
b) The process of improving precision
c) The approach of an approximation to the true value
d) The rate of truncation error

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Indicate the use of conv function in signal processing. (3)
3. Understand how to create and manipulate cell arrays in MATLAB. (3)
4. Compute the MATLAB code to solve the second-order ODE $d^2y/dt^2 + 3dy/dt + 2y = 0$ with initial conditions $y(0) = 1$ and $dy/dt(0) = 0$. (3)
5. Explain the purpose of the events option in the odeset function when using ODE solvers in MATLAB? Provide a simple example of how it can be used. (3)
6. Evaluate a MATLAB function to represent the following first-order ODE: $dy/dt = t - y$, with the initial condition $y(0) = 1$ (3)

OR

Evaluate the purpose of the odeset function in MATLAB when solving IVPs. Provide a simple example of its usage. (3)

Group-C

(Long Answer Type Questions) 5 x 8=40

7. Analyze the efficiency of MATLAB's vectorized operations over loops. (5)
8. Explain the impact of MATLAB's interp1 function in numerical interpolation. (5)
9. Analyze the influence of matrix sparsity on computational performance in MATLAB. (5)

10. Justify the importance of error estimation in numerical differentiation. (5)
11. Identify the advantages of using MATLAB's fminunc function for unconstrained optimization. (5)
12. Select an appropriate MATLAB function for solving nonlinear equations and justify your choice. (5)
13. Explain the significance of MATLAB's bvp4c solver in boundary value problems. (5)
14. Estimate the computational advantages of MATLAB's parallel computing toolbox. (5)

OR

Justify the use of MATLAB's ode113 solver for variable-step integration. (5)

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Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125