

## School of Computing Science and Engineering

Bachelor of Technology in Computer Science and Engineering

Mid Term Examination - Nov 2023

Duration : 90 Minutes

Max Marks : 50

### Sem V - E2UC512T - Advanced Numerical Methods

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Explain Jacobi method for symmetric matrices. K2 (2)
- 2) Discuss Newton Raphson method for function of two variables. K1 (3)
- 3) Estimate the absolute error if the number  $X = 0.00545828$  is K2 (4)
  1. Truncated to three decimal places
  2. Rounded off to three decimal places.
- 4) Estimate the value of  $\int_{-1}^1 \frac{\sin x \, dx}{1+x^2}$  using Gauss formula for  $n=2$  and  $n=3$ . K2 (6)
- 5) If  $u = \frac{4x^2y^2}{z^4}$  and errors in  $x, y, z$  be 0.001, examine the maximum absolute, relative, percentage error in  $u$ , when  $x = 1, y = 1, z = 1$  K3 (6)
- 6) Find the largest Eigen value and corresponding Eigen vector of the K3 (9)

matrix  $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$

using the power method. Take  $[1,0,0]^T$  as initial Eigen vector.
- 7) **Classify** Jacobi's method, find all the eigen values and the eigen K4 (8)

vectors of the matrix  $\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$ .
- 8) Analyze the system of nonlinear equations:  $x^2 + y = 11, y^2 + x = 7$  with the K4 (12)

help of Newton Raphson method.

**OR**

Classify advanced Newton-Raphson method and solve the system of K4 (12)  
 equations  $x^2 + y^2 - 1 = 0, y - x^2 = 0$  taking initial approximation  
 $(x_0, y_0) = (0.7071, 0.7071)$