A **1422TCE100092301** **Pages: 2**

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester M.Tech Degree (FT and PT) Regular Examination June 2023

Discipline: CIVIL ENGINEERING

Course Code & Name: 222TCE100 ADVANCED NUMERICAL METHODS

Max. Marks: 60 Duration: 2.5 Hours

PART A

Answer all questions. Each question carries 5 marks Marks

1 Differentiate between direct method and iterative method for the solutions of simultaneous Linear Systems of Equations. (5)

2 Explain boundary value problem and initial value problem, with one method each for their solution. (5)

3 Explain the parabolic and elliptic partial differential equations with examples. (5)

4 Write the general procedure of FEA (5)

5 Write short note on Shape functions (5)

PART B

Answer any 5 questions. Each question carries 7 marks

6 Use the Jacobi method to approximate the solution of the following system of linear equations. (7)

$5a + 2b - 3c = 1$

$3a - 9b - c = -2$

$-2a + b + 7c = -3$

Continue the iterations until two successive approximations are identical when rounded to three significant digits.

7 Use Euler's method to find y(2), given that $\frac{dy}{dx} = -2x^3 + 12x^2 - 20x + 8.5$ and y(0) =1. Use step size of 0.5. Compare with the exact solution. (7)

8 Solve the equation $U_{,t} = U_{,xx}$ by Schmidt's method, subject to $U(x,0) = \sin \pi x$, $0 \leq x \leq 1$, $U(0,t) = U(1,t) = 0$. Compute the values of U(x,t) for two levels taking, $\Delta x = 1/4$ and $\Delta t = 1/25$. (7)

9 Solve the equation $U_{,xx}+ U_{,yy} = -(x^2+y^2)$ over a square region with sides 3units, Given U=0 on the boundary. Take mesh length =1 unit. (7)

10 Write a note on mathematical modelling of field problems in Engineering with suitable examples. Also explain the limitations of such models. (7)

11 List the advantages and disadvantages of finite element method. (7)

12 Derive element stiffness matrix of a bar element based on interpolation of displacements from nodal degrees of freedom. (7)

*****