

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY-FEBRUARY 2023

per Code: IT201 Subject: Computational Methods/Computational Techniques

ICT217

Computational Methods

me: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all. Internal choice is indicated. Use of calculator is allowed.

Q1 Use method of false position (*Regula Falsi*) to find the value of $\sqrt[3]{30}$ (15)
correct to four decimal places. (Note: Show your calculations)

OR

Find the real root of $x^3 - 4x - 9 = 0$ by Newton Raphson method, correct (15)
to four decimal places. (Note: Show your calculations)

Q2

Establish that the Newton - Raphson's method for root finding has (15)
quadratic rate of converges for roots with multiplicity one.

OR

Derive the iteration equation for the secant method of root finding and (15)
describe an algorithm to use this method to find the root of a given
function $f(x)$.

Q3

Solve the following system of linear equations by Gauss elimination (15)
method (show all steps):

$$\begin{aligned} 2x_1 + x_2 - x_3 + 2x_4 &= 5 \\ 4x_1 + 5x_2 - 3x_3 + 6x_4 &= 9 \\ -2x_1 + 5x_2 - 2x_3 + 6x_4 &= 4 \\ 4x_1 + 11x_2 - 4x_3 + 8x_4 &= 2 \end{aligned}$$

OR

Using power method, find the numerically largest eigenvalue of the (15)
matrix (show all steps):

$$\begin{bmatrix} 10 & 2 & 1 \\ 2 & 10 & 1 \\ 2 & 1 & 10 \end{bmatrix}$$

Q4

Find $f(x)$ as a polynomial in x for the following data by Newton's divided (15)
difference formula (show all steps):

$x:$	-4	-1	0	2	5
$f(x):$	1245	33	5	9	1335

And find the value of $f(0.5)$.

OR

Estimate $f(42)$ from the following data using backward interpolation. (15)

$x:$	20	25	30	35	40	45
$f(x):$	354	332	291	260	231	201

P.T.O.

Q5

Derive the Simpson's 1/3 rule

OR

Approximate the value of the integral: $I = \int_0^1 e^{-x^2} dx$, using Simpson's 3/8th rule and $h = 0.25$

(15)

(15)

Q6

Find a quadratic spline interpolant for these data:

X	-1	0	1/2	1	2	5/2
y	2	1	0	1	2	3

(15)

OR

Derive the equations for Runge-Kutta method of order 2

(15)

Q7(a) What is a Parabolic Partial Differential Equation (PDE). Discuss how a Parabolic Partial Differential equation may be solved.

(7.5)

(b) Describe and Discuss the method of steepest descent.

(7.5)

Q8

Write **short notes** on the following:

(a) Representation by integers in 2's complement notation, with special emphasis on the range, for N-bit representation

(5+10)

(b) Representation of floating points in the IEEE format (with special emphasis on representation of infinity (INF) and NaN (Not a Number))

