B.E.INFORMATION TECHNOLOGY Examination 2017 Ex/IT/T/226/2017

(2nd year, 2nd semester)

Time: Three hours Full Marks: 100

NUMERICAL METHODS & OPTIMIZATION TECHNIQUES

PART-I

Group-A 10*1=10

1. (i) In Simpson's 1/3rd rule of finding $\int_a^b f(x)dx$ f(x) is approximated by

(a) line Segment (b) parabola

(c) Circular sector (d) Part of ellipse

(ii). Which of the following relations is true ?

(a) E = 1+Δ

(b) E = 1-Δ

(c) E =1/Δ

(d) none of these

(iii). Newton-Raphson method fails when

(a) $f'(x) = 1$

(b) $f'(x) = 0$

(c) $f'(x) = -1$

(d) $f''(x) = 0$

(iv). Condition of convergence for Euler's method

(a) $|1+hf'(x_i,y_i)|<1$

(b) $|1+hf'(x_i,y_i)|<=1$

(c) $|1+hf'(x_i,y_i)|>1$

(d) $|1+hf'(x_i,y_i)|>=1$

(v). Divided difference interpolation formula can be used for

(a) The tabular values with independent variable unequally spaced

(b) Inverse interpolation

(c) both (a) and (b)

(d) None of these

(vi). Gauss Seidel method for solution of a system of linear simultaneous equations converges if

(a) $|a_{ii}|>=|a_{ij}|$, where j≠i

(b) $|a_{ii}|>|a_{ij}|$, where j! =i

(c) $|a_{ii}|/|a_{nn}|=1$

(d) None of these

(vii). Ragula_falsi method has a convergence rate of the order of

(a) 2 (b) 1.62 (c) 1 (d) None of these

(viii). Newton-Raphson method is used to find the root of the equation $x^2 - 2 = 0$. If iterations are started from - 1, then iterations will be

(a) converge to -1

(b) converge to √2

(c) converge to -√2

(d) no coverage

(ix). The degree of precision of Simpson's one third rule is

(a) 1 (b) 2 (c) 3 (d) 5

(x). Lagrange's interpolation formula deals with

(a) Equispaced arguments only

(b) Unequispaced argument only

(c) both (a) and (b)

(d) None of these

Group-B Attempt any three (3): 3*5=15

2. Find the positive real root of $x^3-x^2-1=0$, using the bisection method of 4 iterations. (5)

3. Estimate the value of the integral by Simpson's 1/3rd rule taking 4 strips

$$\int_1^3 1/x\,dx$$ (5)

4. Solve by using Euler's Method the following differential equation for x=1 by taking h=0.2

dy/dx=xy, y=1, when x=0 (5)

5. From the following table find the values of f (12) by Newton's divided difference interpolation formula:

x: 11	13	14	18	19	21
y: 1342	2210	2758	5850	6878	9282

(5)

PART-II

Attempt any five (5) questions: 5*15=75

6.(a) Solve the given system of equations:

$10x+2y+z = 9$

$2x+20y-2z = -44$

$-2x+3y+10z = 22$

by Gauss Seidel method. (8)

(b) Derive Newton's Back ward difference interpolation formula. (5)

(c) Define Δ, E (2)

7. (a) Solve the following system of equations using LU factorization method.

$3x-y+2z = 12$

$x+2y+3z = 11$

$2x-2y-z = 2$ (8)

(b) Find the inverse of the following matrix.

$$A = \begin{vmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{vmatrix}$$

(7)

8. (a) Find Lagrange's interpolation polynomial passing through the set of points:

x:	0	1	2
y:	4	3	6

use it to find y at x=1.5 dy/dx at x=0.5 and evaluate $\int_0^3 y dx$ (8)

(b)Find the value of $\log 2^{1/3}$ from $\int_0^1 f(x)dx$,where $f(x)=x^2/(1+x^3)$ using Simpson's 1/3rd rule with h=0.25 (7)

9. (a) Evaluate $\int_0^1 f(x)dx$, f(x)= xe^x where the interval (0,-1) by using Trapizoidal rule taking n=6

(5)

(b) Find the Newton-Raphson iteration formula to find the pth root of positive number N and hence find the cube root of 17.

(5)

(c)Solve the following equation using bisection method:

$$3x + \sin x - e^x = 0$$

take x_0=1 and x_1=0 result is required to be corrected upto 2 decimal places. (5)

10. (a) Find the polynomial f(x) and hence calculate f(5.5) for the given data

x:	0	2	3	5	7	
y:	1	47	97	251	477	

(6)

(b) Find a root of the equation $x\sin x + \cos x = 0$ using Newton-Raphson method correct upto 5 places of decimal.

(6)

(c) Define advantage and disadvantage of Newton-Raphson method. (3)

11.(a) Using Newton's forward formula compute y_{12} given that y_{10} = 600, y_{20}= 512, y_{30} = 439, y_{40} = 346, y_{50} =243.

(7)

(b) Solve the following initial value problem using Euler's method $dy/dx = x^2+y$ with y (0) =1 compute the first 5 steps of the solution with h=0.1 (8)