Name:..... Reg. No.....

Department of Computer Science & Engineering
Motilal Nehru National Institute of Technology, Allahabad
End Sem. Examination (EVEN-Semester) 2017-18

Class:B.Tech.(VI) Sem.(Computer Sc.&Engg. AND I.T.) 2017-18

M.M. : 60 **Subject: Scientific Computing** (Code:CS-1602) M. Hrs: Three Hour

Note: 1.There are TWO parts of the Question Paper (A&B).Attempt any three(03) from Part(A) & Part(B) BOTH.So TOTAL SIX(06) questions are to be attempted.
2.Each Questions carry equal Marks : TEN(10).
3.Write ALL parts of a question together NOT here & there.
4.Write to the point. Make & State necessary assumptions, if any.

PART- (A):(Attempt any Three(03) Questions ONLY from PART-(A))

Q.1 (a) State "**Intermediate Value Theorem**". How it is used to find an initial approximation to the root of **f(x)=0**?

(b) What is the Descartes' Rule of Signs? **(c)** Define Convergence of an Iterative Method.

(d) What are the criteria used to terminate an Iterative Procedure.**(e)** When does the Newton-Raphson method fail? **(02X5 = 10)**

Q.No.2 (a) Why **Newton-Raphson method** for non-linear equation is also called **Chord Method**?

(b) Derive the **Newtons Method** for finding **(1 / N)** , where N>0. Hence, find 1/17, using the initial approximation as (i)0.05, & (ii) 0.15 . Do the iterations Converge? ***(02+08=10)***

Q.No.3: (a) Find the smallest positive root of the equation $X^3 - X - 10 = 0$, using the **General Iteration Method.**

(b) The following values of the function **f(x) = sin x + cos x**, are given-

x	10^0	20^0	30^0
f(x)	1.1585	1.2817	1.3660

Construct the quadratic **Lagrange interpolating polynomial** that fits the above data. Hence, find **f (π/12)**. Compare with the exact value. **(04+06=10)**

Q.No.4: **(a)** Use **Lagranges's formula**, to find the Quadratic Polynomial that takes the values:

x	0	1	3
y	0	1	0

(b) For the following data , Calculate the differences & obtain the Newtons forward and Backward difference Interpolation Polynomials. **Are these Polynomials different? Justify.** Interpolate at x=0.25 & x=0.35.

X	0.1	0.2	0.3	0.4	0.5
f(x)	1.40	1.56	1.76	2.00	2.28

(03+07=10)

(Continued on Page No.2)

PART- (B):(Attempt any Three(03) Questions ONLY from PART-(B))

Q.No.5 (a) Find **dy/dx at x=1** from the following table of values:

x	1	2	3	4
y	1	8	27	64

(b) The table below gives Velocity of a Particle for 8 Seconds at an Interval of 2 Seconds. Find the **initial Acceleration** using the entire Data. **(05+05=10)**

Time(Sec)	0	2	4	6	8
Velocity(m/Sec)	0	172	1304	4356	10288

Q.No.6 (a) Find approximate value of $\int_0^1 \frac{dx}{1+x}$ using **Trapezium rule & Sympson's 1/3 Rule** with 2 & 4 Equal subintervals. Using the exact solution, find absolute errors.

(b) Compare the above TWO RESULTs? (Write just **TWO** Points)

(04X2 + 02 = 10)

Q.No.7 Use the Heun's method (**second order Runge-Kutta method**) to Solve the initial Value problem, $\mathbf{dy/dx = -2xy^2}$, $y(0) = 1$,with $h = 0.2$ on the interval [0, 0.4]. Compare with the exact solution: $\mathbf{y(x) = 1/(1 + x^2)}$. (Write just **TWO** Points)

(10)

Q.No. 8 Use the **fourth order classical Runge-Kutta method** to Solve the initial Value problem, $\mathbf{dy/dx = -2xy^2}$, $y(0) = 1$,with $h = 0.2$ on the interval [0, 0.4]. Compare with the exact solution: $\mathbf{y(x) = 1/(1 + x^2)}$. (Write just **TWO** Points)

(10)

Q.No.9 Using Milne's Predictor-Corrector Method , find **y(0.4)** for the initial value Problem $\mathbf{y'=x^2 + y^2}$, **y(0)=1 with h=0.1**

Calculate all the required initial values by Euler's Method. The result is to be accurate to two decimal places. **(10)**

*All the Best *