Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name : Numerical Methods

Subject Code : 4SC04MTE1   **Branch: B.Sc.(Mathematics, Physics)**

Semester : 4   **Date : 16/05/2016**   **Time : 02:30 To 05:30**   **Marks : 70**

Instructions:
    (1) Use of Programmable calculator & any other electronic instrument is prohibited.
    (2) Instructions written on main answer book are strictly to be obeyed.
    (3) Draw neat diagrams and figures (if necessary) at right places.
    (4) Assume suitable data if needed.

Q-1	**Attempt the following questions**	**(14)**
a)	Write Simpson's one third rule.	**(01)**
b)	Write n^{th} approximation of Newton-Raphson method.	**(01)**
c)	Give value of $f'(x)$ by Newton's forward interpolation formula.	**(01)**
d)	What is the value of h?	**(01)**
e)	Newton-Raphson method has second order convergence. Is following statement is true or false?	**(01)**
f)	Write Picard's formula for $\frac{dy}{dx}=f(x,y)$.	**(01)**
g)	How many ways we can find the solution of $\frac{dy}{dx}=f(x,y)$ with $f(x_0)=y_0$.Give any two names of method.	**(01)**
h)	What is the value of $f''(x)$ in general by Stirling inter polation formula?	**(01)**
i)	Find the values of $\int_0^1 e^x \, dx$ with $h=1/2$ by Trapezoidal rule.	**(02)**
j)	Give value of a & b such that root of $f(x)=0$ lies between a & b,where $f(x)=x^2+x-5$.	**(02)**
k)	Give general formula for Modified Euler Method.	**(02)**

Attempt any four questions from Q-2 to Q-8.

Q-2	**Attempt all questions**	**(14)**
a)	Find a root of $f(x)=3x-6-\log_{10}x$ using Iteration Method up to four decimal places.	**(07)**
b)	Evaluate $\int_0^{10} e^x \, dx$ by Weddle's rule with $h=1$.	**(07)**

Q-3	**Attempt all questions**	**(14)**
a)	Prove that Newton-Raphson Method has second order convergence.	**(07)**
b)	Using Picard's Method, obtain solution up to the fifth approximation to the equation $\frac{dy}{dx}=x+y; y(0)=1$. Also find $y(0.1)$.	**(07)**

Q-4   **Attempt all questions**   **(14)**

a) Given $y' = x^2 + y^2$, $y(0) = 1$. Determine $y(0.1)$ and $y(0.2)$ by Modified Euler Method.   **(07)**

b) Find a positive root of $f(x) = x - \cos x$ by False Position Method correct to three decimal places.   **(07)**

Q-5   **Attempt all questions**   **(14)**

a) Derive $f'(x)$ by Newton's Forward Interpolation Formula.   **(07)**

b) Compute $y(2)$ if $y(x)$ satisfies the equation $\frac{dy}{dx} = \frac{1}{2}(x + y)$ given $y(0) = 2$, $y(0.5) = 2.636$, $y(1) = 3.595$ and $y(1.5) = 4.968$. Using Milne's Method.   **(07)**

Q-6   **Attempt all questions**   **(14)**

a) Find $y'(x)$ and $y''(x)$ at $x = 6$. For the function $y = f(x)$ given in the table: **(07)**

x	1	2	3	4	5	6
y	2.7183	3.3210	4.0552	4.9530	6.0196	7.3891

b) Obtain approximate value of the root of $x = \sin x + \frac{\pi}{2}$ by Graphical Method.   **(07)**

Q-7   **Attempt all questions**   **(14)**

a) Compute $f'(0.8)$ and $f''(0.8)$ using the following table: **(07)**

x	0.4	0.6	0.7	0.9	1.2
$f(x)$	1.08107	1.18546	1.25517	1.43309	1.81066

b) Derive Newton-Raphson Iteration formula for $\sqrt[n]{R}$. Also find the value of $\sqrt[3]{5}$ using this formula.   **(07)**

Q-8   **Attempt all questions**   **(14)**

a) Using Runge-Kutta Method of fourth order, solve the following for $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$ with $h = 0.1$.   **(07)**

b) The velocity v of a particle at distance's from point on its path is given by the following table: **(07)**

s (m)	0	10	20	30	40	50	60
v (m/s)	47	58	64	65	61	52	38

Find the time taken to travel 60 meter. Using Simpson's one-third rule.