Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140105 **Date:19/12/2015**

Subject Name: NUMERICAL METHODS

Time: 2:30pm to 5:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Derive the normalized equation for fitting a second degree parabola. Also find the approximate value of a and b in $y=a+bx+cx^2$ using the following experimental values **07**

x	0	1	2
y	1	6	17

(b) State the Newtons backward interpolation formula and hence use appropriate formula to find F(10) from the available data **07**

X	3	4	5	6	7	8	9
F(x)	2.7	6.4	12.5	21.6	34.3	51.2	72.9

Q.2 (a) Discuss the lagrange's interpolation formula for four data points. If y(1)= 4, y(3)=12, y(4)=19, y(6)=132, find the inverse lagranges interpolation polynomial and hence evaluate x for y=7. **07**

(b) (i) Use Newtons divided difference formula to evaluate f(301) from the following table, **07**

x	300	304	305	307
f(x)	2.4771	2.4829	2.4843	2.4871

(ii) Prove $\mu E = E\mu$.

OR

(b) (i) Employee stirlings formula to compute y(1.91) from the table **07**

x	1.7	1.8	1.9	2	2.1	2.2
y(x)	5.4739	6.0496	6.6859	7.3891	8.1662	9.0250

(ii) Prove $\mu\delta = \frac{1}{2}(\Delta + \nabla)$.

Q.3 (a) Find y for x=2 using the data (1,-3), (3,9), (4,30), (6,132) use appropriate method **07**

(b) Evaluate the integral $\int_0^{\frac{\pi}{2}} \sin x dx$ by Simpson 1/3rd rule and Simpsons 3/8th rule with 4 strips and 8 strips. **07**

OR

Q.3 (a) Apply shooting method to solve $y^{11}(x) = y(x),$ $y(0) = 0 \quad and \quad y(1) = 1.1752$ **07**

(b) Solve using Gauss elimination method $\begin{aligned} 5x-2y+z&=4 \\ 7x+y-5z&=8 \\ 3x+7y+4z&=10 \end{aligned}$. **07**

Q.4 **(a)** Solve using bisection method $f(x)=x^3-x-1=0$, correct upto 3 decimal places. **07**

(b) Implement Newton Raphson method to find the root of $f(x)=x\sin x+\cos x \quad with \quad x_0=\pi$. **07**

OR

Q.4 **(a)** Solve using method of false position $f(x)=xe^x-2=0.$ correct upto 3 decimal places between 0.8 and 0.9. **07**

(b) Solve using secant method correct upto 4 decimal places $\cos x=xe^x \quad within \quad (0,1)$ **07**

Q.5 **(a)** Solve using Runge Kutta 2nd order method $\frac{dy}{dx}=x-y^2 \quad with \quad y(0)=1.$ Compute for y(0.2) and y(0.4). **07**

(b) Solve $\frac{dy}{dx}=x+y$ with y(0)=1 by modified Euler method for x=0.1 correct upto four decimal places by taking h=0.05. **07**

OR

Q.5 **(a)** State the first and second order finite difference formulae, Apply finite difference method to solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial^2 x^2}$ with boundary conditions u=0 when x=0 and x=1. And u(1,t)=t taking k=1/8 and h=1/2. **07**

(b) Solve the two point boundary value problem defined by $\begin{aligned} y^{11}+x&=0, \quad 0<x<1 \\ y(0)&=y(1)=0 \end{aligned}$ Using Rayleigh Ritz method. **07**

****