FirstRanker.com
Firstranker's choice
Seat No.: _____ www.FirstRanker.com Enrolment No. www.FirstRanker.com

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2140105 **Date:22/11/2018**

Subject Name:Numerical Methods

Time: 02:30 PM TO 05:00 PM **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)** Name five iterative methods which evaluate the root of equations. **03**

(b) Perform five iterations of Bisection method to obtain real root of $x^3 - x - 1 = 0$. **04**

(c) By the method of least squares, find the straight line $y = ax + b$ that best fits the following data: **07**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

Q.2 **(a)** Mention atleast two difference between Newton's forward Interpolation and Newton's divided difference interpolation. **03**

(b) Find second degree polynomial passing through the points (-1, 8), (0, 3), (2, 1) and (3, 12) using Lagrange interpolation. **04**

(c) Obtain cubic splines for every subintervals from the following data: **07**

x	0	1	2	3
y	1	2	33	244

OR

(c) Using Newton's Divided Difference Interpolation find f(x) from the following table: **07**

x	1	2	7	8
y	1	5	5	4

Q.3 **(a)** Use Gauss Elimination to solve: **03**

x + 3y + 2z = 5
2x + 4y - 6z = -4
x + 5y + 3z = 10

(b) Consider following tabular values: **04**

x	25	25.1	25.2	25.3	25.4	25.5	25.6
F(x)	3.205	3.217	3.232	3.245	3.256	3.268	3.280

Determine the area bounded by given curve and x-axis between x = 25 to x = 25.6 by the Trapezoidal rule.

(c) Describe Newton-Raphson method and find root of equation $x\sin x + \cos x = 0$ which is near π correct upto 5 decimal places. **07**

OR

Q.3 **(a)** Find approximate root of $x^3 - 2x - 1 = 0$ starting from $x_0 = 1.5$ to $x_1 = 2$ by Secant method correct upto 3 decimal places. **03**

(b) Evaluate by Simpson's $\frac{1}{3}$ Rule, $\int_0^5 \frac{1}{5+4x}dx$ taking 10 equal parts, hence obtain approximate value of $\log_e 5$. **04**

www.FirstRanker.com

FirstRanker.com
Firstranker's choice
www.FirstRanker.com www.FirstRanker.com

	(c)	State diagonally dominant condition and evaluate by Gauss-Siedel method: $5x + y - z = 10$ $2x + 4y + z = 14$ $x + y + 8z = 20$	**07**
Q.4	**(a)**	State finite difference quotients for first and second order derivatives.	**03**
	(b)	Solve heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with u(x, 0) = 0, u(0, t) = 0 and u(1, t) = t with k = $\frac{1}{8}$, h = $\frac{1}{4}$.	**04**
	(c)	Solve by Runge-Kutta fourth order $\frac{dy}{dx} = 2x + y$, y(0) = 1, h = 0.1 find y (0.1) and y(0.2).	**07**
		OR	
Q.4	**(a)**	State Gauss-Seidel method for Laplace equation.	**03**
	(b)	Discuss shooting approach for Boundary Value Problem in brief.	**04**
	(c)	Write two differences between finite difference method and finite element method.	**07**
Q.5	**(a)**	Evaluate (1) $(1+\Delta)(1-\nabla) = 1$ (2) $\Delta = E\nabla$	**03**
	(b)	Solve by Runge-Kutta second order $\frac{dy}{dx} = 3x + y$, y(1)=1.3, h=0.1 find y (1.2).	**04**
	(c)	Evaluate IVP $\frac{dy}{dx} = x\sqrt{y}$, y(1) = 1 and hence find y(1.5) taking h=0.1 by Euler's method.	**07**
		OR	
Q.5	**(a)**	Describe Galerkin approach in brief.	**03**
	(b)	Solve y"= x + y with boundary conditions y(0) = y(1) = 0 by finite difference method.	**04**
	(c)	Describe Rayleigh Ritz method in brief.	**07**

****

www.FirstRanker.com

www.FirstRanker.com