Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2140105 **Date: 30/05/2017**

Subject Name: Numerical Methods

Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

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

			MARKS
Q.1		**Short Questions**	**14**
	1	State true or false, Runge Kutta is self starting method.	
	2	State picards formula	
	3	Which of the following is a step-by-step method a)Taylors b)Picards c) Adams method d)none of them	
	4	State an iterative method to solve first order first degree differential equation.	
	5	How to choose interval in bisection method.	
	6	Which method is more accurate among trapezoidal and Simpson rule.	
	7	Which interpolation method supports unequal interval examples, Newton forward or Lagranges interpolation method	
	8	State the normalized equations for fitting straight line using method of least square.	
	9	The equation $u_t = c^2 u_{xx}$ is a)laplace equation b)hyperbolic equation c)parabolic equation d)none	
	10	State Runge kutta 4th order method formulae for y_1 .	
	11	The first approximate of y_1 for IVP $\frac{dy}{dx} = \frac{x-y}{2}$ $y(0) = 1$ using Euler on[0,3] at h=0.25 is ……	
	12	State value of p for Newtons backward formula.	
	13	State Newton Raphson formulae	
	14	Name two finite element approaches	
Q.2	**(a)**	Solve using successive approximation method $x^4 - x - 10 = 0$ correct upto three decimal places with $x_0 = 1.5$	**03**
	(b)	Find a positive root using Newton Raphson method for $x^3 + 2x^2 + 10x - 20 = 0$.	**04**
	(c)	Use Secant method to solve $e^{-x} - x = 0$ correct upto two decimal places with $x_{-1} = 0$ $x_0 = 1$.	**07**

OR

(c) Find the real root of equation $f(x) = xe^x - 2 = 0$ which lies between 0.8 and 0.9. correct to three decimal places. **07**

Q.3 **(a)** Use Newtons forward formula to form the forward table From the data **03**

x	1.7	1.8	1.9	2
J(x)	0.3979849	0.3399864	0.2818186	0.2238908

(b) Use trapezoidal rule to evaluate $\int_0^1 \frac{dx}{1+x^2}$ with h=1/6. **04**

(c) Solve the system using Gauss elimination method 3x+y-z=3,2x-8y+z=-5, x-2y+9z=8. **07**

OR

Q.3 **(a)** Use Stirlings formula to compute y_{35} from the table **03**

x	10	20	30	40	50
y	600	512	439	346	243

(b) Use Simpsons 1/3rd rule to evaluate **04**

$\int_0^2 e^{-x^2} dx$ for h=0.5.

(c) Fit cubic spline for the first two intervals from the following data use the result to compute value at x=5 **07**

x	3	4.5	7	9
F(x)	2.5	1	2.5	0.5

Q.4 **(a)** Solve using Taylors series method $\frac{dy}{dx} = xy^{\frac{1}{3}}$ with y(1)=1. **03**

(b) Using Runge Kutta 4th order solve **04**

$\frac{dy}{dx} = \frac{y^2 - 2x}{y^2 + 2x}$ $y(0) = 0$ at $x = 0.1$ with two iterations.

(c) Discuss the concept of finite difference method for **07**

$u_{xx} + u_{yy} = 0$

OR

Q.4 **(a)** Solve using Picards method $\frac{dy}{dx} = \frac{y-x}{y+x}$ $y(0) = 1$ for x=0.1. **03**

(b) Explain the difference between finite difference and finite element method **04**

(c) Solve using Euler method **07**

$\frac{dy}{dx} = \log(x+y)$ $y(1) = 2$ for $x = 1.2$ and $x = 1.4$

Q.5 **(a)** Fit the straight line to the given data using least square method for the data, **03**

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

(b) Describe the Galerikin approach in brief **04**

(c) Explain shooting method procedures **07**

OR

Q.5 **(a)** A simply supported beam carries a concentrated load P at its midpoint. Corresponding to various values of P the maximum deflection Y is measured Find the law of the form Y=a+bP using least square method. **03**

P	100	120	140	160	180	200
Y	0.45	.55	.60	.70	.80	.85

(b) Describe the Rayleigh ritz method in brief. **04**

(c) Explain successive over relaxation method state the forward finite difference for second order partial differential equation. **07**

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