GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-IV(New) EXAMINATION - SUMMER 2016

Subject Code:2140105 **Subject Name:Numerical Methods** Time:10:30 AM to 01:00 PM **Instructions:**

Total Marks: 70

Date:26/05/2016

1. Attempt all questions.

- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

MARKS

14

0.1 **Short Questions**

- State the normalized equations for the least square method 1 $y=a+bx+cx^2$.
- State Gauss forward interpolation formula. 2
- 3 Name the unequal interpolation methods.
- State the difference between Runge Kutta 2nd order and 4th 4 order method.
- State the types of partial differential equations. 5
- Give example of an initial valued problem. 6
- 7 State methods for solving boundary valued problem.
- Prove that $\nabla = 1 E^{-1}$ 8
- Discuss the difference between finite element method and 9 finite difference method.
- Prove that $E\nabla = \nabla E$. 10
- State the formula of Weddles rule. 11
- 12 State the value of p in Newton backward interpolation
- Give discretized form of parabolic equation. 13
- Discuss the cubic spline approach. 14

(a) State the normalized formula for fitting the curve $y=e^{bx}$ Q.2 03

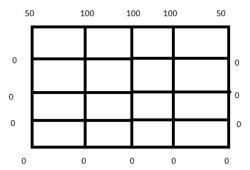
| x | | 0 | 1 | | 2 | |
|-------|-----|-----|-----|-----|-----|--|
| у | | 1 | 6 | | 17 | |
| Given | | | | | | |
| x | 10 | 20 | 30 | 40 | 50 | |
| | 600 | 512 | 439 | 346 | 243 | |

and (c) State implement Newtons divided difference 07 interpolation find the polynomial satisfying the data -1 3 0 1 х

2 0 1 -1 v (a) Find a real root of the equation $x^3-2x-5=0$ using bisection 03 0.3 method correct upto three decimal places.

Solve the system using Gauss elimination method **(b)** 04 2x-y+3z=8, -x+2y+z=4, 3x+y-4z=0.

| | (c) | Evaluate integral using Simpson 3/8 rule | | | | | | |
|---------------------|---|--|-----|--|--|--|--|--|
| | | $\int_{0}^{\frac{\pi}{2}} \sin x dx$ with 10 equal parts. State the formula of Simpson 1/3 rd rule. | | | | | | |
| | | OR | | | | | | |
| Q.3 | (a) (b) | | | | | | | |
| | | Solve using trapezoidal rule, $\int_{1}^{5} \log_{10} x dx$. | 04 | | | | | |
| | (c) | Solve using Gauss Jacobi method | 07 | | | | | |
| 0.4 | (\mathbf{a}) | 27x+6y-z=85, 6x+5y+2z=72, x+y+54z=110. | 02 | | | | | |
| Q.4 | (a) | Given $\frac{dy}{dx} = x + y^2$, $y(0)=1$. Use Runge Kutta | 03 | | | | | |
| | | method for evaluating $y(0.2)$. | | | | | | |
| | (b) | Obtain Picard's second approximation solution of the initial | 04 | | | | | |
| | | valued problem for, $\frac{dy}{dx} = x^2 + y^2$ for x=0.4 | | | | | | |
| | | correct to three decimal places with $y(0)=0$. | 07 | | | | | |
| | (c) Solve $\frac{dy}{dx} = x + y$ with $y(0)=1$ by Euler's modified | | | | | | | |
| | | method for $x=0.1$. with $h=0.05$. | | | | | | |
| Q.4 | (a) | OR State Eulers formula for IVP and solve | 03 | | | | | |
| Y . - | (a) | - | 05 | | | | | |
| | | $\frac{dy}{dx} = x - y^2 \text{ with y(0)=1.}$ | | | | | | |
| | (b) | | 04 | | | | | |
| | | Using Taylors series solve $\frac{dy}{dx} = xy^{\frac{1}{3}}$, $y(1)=1$. Find | ••• | | | | | |
| | | <i>y</i> (1.1). | | | | | | |
| | (c) | Compute y for x=0.2 and x=0.4 for $\frac{dy}{dx} = y - \frac{2x}{y}$ | 07 | | | | | |
| | | Compute y for x=0.2 and x=0.4 for $\frac{y}{dx} = y - \frac{y}{y}$ | | | | | | |
| | | , $y(0)=1$. Using Rung Kutta 4 th order method. | | | | | | |
| Q.5 | (a) | State the finite difference formula for forward, backward | 03 | | | | | |
| | | and central formula for $\frac{dy}{dx}$ | | | | | | |
| | | and central formula for $\frac{1}{dx}$ | | | | | | |
| | (b) | Solve the laplace equation with boundary | 04 | | | | | |



(c) Implement Rayleigh Ritz method to solve y''+x=0.0 < x < 1. 07 y(0)=y(1)=0.

OR

Q.5 (a) State the Successive over relaxation method. 03

- (b) Solve the boundary valued problem using shooting method y''=y with y(0)=0, y(1)=1.1752. 04
- (c) Solve using Galerikin approach y''+y=-x, 0 < x < 1 07 y(0)=y(1)=0.
