B.Tech. 5th Semester (Civil Engg.) F-Scheme

Examination, July-2015

NUMERICAL METHODS AND COMPUTING **TECHNIQUES**

Paper-CE-309-F

Time allowed: 3 hours] [Maximum marks: 100

Attempt five questions in total taking at least one from each section. Question No. 1 is compulsory.

- Explain how B-spline curves differ from Bezier 1. (a) curves.
 - Gauss-Seidel method is similar in principle to (by) Jacobi method. Then, what is the difference between them?
 - Prove that the bisection method is linearly convergent.
 - State the formula of Euler's method. Illustrate its concept graphically.

Write normal equations for evaluating the parameters a and b to fit data to

- (i) y = a + bx
- (ii) $y = a e^{bx}$.

24291-P-4-Q-9 (15)

[P.T.O.

Section-A

2. (a) Find the Lagrange interpolation polynomial to the following data

x : 0 : 1 : 2 : 3 $e^{x} - 1 : 0 : 1.7183 : 6.3891 : 19.0855$ use the polynomial to estimate the value of $e^{1.5}$.

- (b) Given the set of data points (1, -8), (2, -1) an
 (3, 18), find the cubic splines. Find also th approximate values of y (2.5) and y' (2.0). Her given data satisfying the function y = f(x).
- 3. (a) Find the root of the equation

 (b) Find the root of the equation

 (c) Find the root of the equation

 (d) Find the root of the equation

 (e) Find the root of the equation

 (e) Find the root of the equation

 (e) Find the root of the equation

 (f) Find the root of the equation

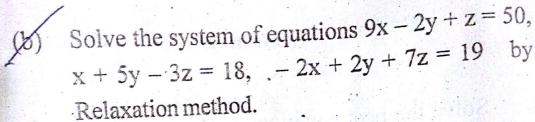
 (g) Find the root of the root of the root of the equation

 (g) Find the root of the roo

Using Muller's method, find the root of the equation $f(x) = x^3 - x - 1 = 0$ with the initial approximations $x_{i-2} = 0$, $x_{i-1} = 1$, $x_i = 2$.

Section-B

Solve the system $2x_1 + 4x_2 - 6x_3 = -8$, $x_1 + 3x_2 + x_3 = 10$, $2x_1 - 4x_2 - 2x_3 = -12$ using Gauss-Jordan method.



(a) The distances travelled by a vehicle at intervals of 2 minutes are given as follows:

Time: 0 2 4 6 8 10 12 14 16

Distance: 0 0.25 1 2.2 4 6.5 8.5 11 13

Evaluate the velocity of the vehicle at time 5, 10 and 13.

(b) Evaluate $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's $\frac{1}{3}$ rd rule.

Section-C

6. Using Runge-Kutta method, find y for x = 0.1, 0.2, 0.3given that $\frac{dy}{dx} = xy + y^2$, y(0) = 1. Continue the solution at x = 0 using Milne's method.

Find the largest eigenvalue and the corresponding eigenvector of the matrix

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

using Power method. Take $[0, 1, 0]^T$ as initial eigen vector.

24291

[P.T.O.

Section-D

Solve the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in 0 < x < 5, $t \ge 0$ given that u(x, 0) = 20, u(0, t) = 0, u(5, t) = 10. Compute u for the time-step with h = 1 to Crank-Nicholson method.

Solve the Laplace equation $u_{xx} + u_{yy} = 0$ given that

