(b) Use Romberg's method to compute $\int_0^1 \frac{1}{1+x^2}\,dx$ correct to four decimal places.

5. (a) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$; find y for $x = 0.1$ by Euler's method.

(b) Using Runge-Kutta method of order four, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2,\ 0.4$.

6. Using Milne's predictor-corrector method, find $y(0.3)$ from :

$$\frac{dy}{dx} = x^2 + y^2,\ y(0) = 1.$$

Find the initial values $y(-0.1)$, y(0.1) and $y(0.2)$ from the Taylor's series method.

No. of Printed Pages : 05 **Roll No. ....**

412

B. Tech. EXAMINATION, May 2018

(Fourth Semester)

(Old Scheme) (Re-appear Only)

(EE, ECE, CHE, EEE, AEI, IC)

MATH202

NUMERICAL METHODS

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Part. All questions carry equal marks.

Part A

1. (a) Fit a parabola $y = a + bx + cx^2$ to the following data :

x	y
2	3.07
4	12.85
6	31.47
8	57.38
10	91.29

(b) Determine $f(x)$ as a polynomial in x for the following data :

x	$f(x)$
–4	1245
–1	33
0	5
2	9
5	1355

2. (a) Using Newton-Raphson formula method find a root of the equation $3x = \cos x + 1$, correct to four places of decimal.

(b) Using bisection method, find a root of the equation $x^3 - 4x - 9 = 0$, correct to four decimal places.

3. (a) Solve the following system of equation by Gauss-Seidel method :

$$20x + y - 2z = 17$$
$$3x + 20y + 4z = 13$$
$$3x + 4y + 5z = 40$$

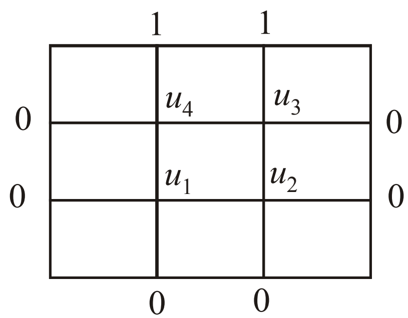
(b) Solve by Gauss-Jordan method :

$$x + y + z = 9$$
$$2x - 3y - z = -18$$
$$2x - 3y + 20z = 25$$

4. (a) From the following data, find dy/dx at $x = 1.1$

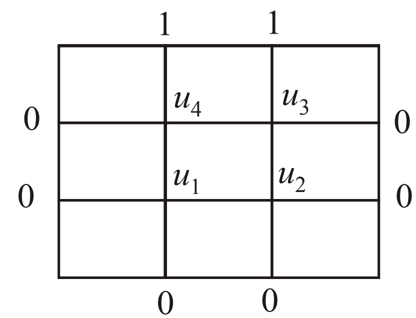
x	y
1.0	7.989
1.1	8.403
1.2	8.781
1.3	9.129
1.4	9.451
1.5	9.750
1.6	10.031

7. Given the values of $u(x, y)$ on the boundary of the square region as shown in figure below, evaluate the function $u(x, y)$ satisfying the Laplace's equation $\nabla^2 u = 0$ at the pivotal points using Gauss-Seidal method :



8. Find the value of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ and the boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, t) = 4x - \frac{1}{2}x^2$ at the points $x = i$: $i = 0, 1, 2, \ldots\ldots, 7$ and $t = \frac{1}{8}j$: $j = 0, 1, 2, \ldots, 5$.

7. Given the values of $u(x, y)$ on the boundary of the square region as shown in figure below, evaluate the function $u(x, y)$ satisfying the Laplace's equation $\nabla^2 u = 0$ at the pivotal points using Gauss-Seidal method :



8. Find the value of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ and the boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, t) = 4x - \frac{1}{2}x^2$ at the points $x = i$: $i = 0, 1, 2, \ldots\ldots, 7$ and $t = \frac{1}{8}j$: $j = 0, 1, 2, \ldots, 5$.