

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
End-Term Examination
B.Tech. Third Year/V Semester/2013-14



Course Name: Numerical Analysis
 Course Code: MA 501

Max Marks: 40
 Time: 3 hrs.

Attempt all sections. Use of calculator is permitted. Be Neat! Be Legible!! All the Best!!!

Section A

- Q. 1. Answer all the questions given below in True/False. (5 Marks)**
- (a) Out of Regula-falsi method and Newton-Raphson method, the rate of convergence is faster for.....
- (b) Whenever Trapezoidal rule is applicable, Simpson's $1/3^{\text{rd}}$ rule is also applicable. (True/False)
- (c) $\nabla^2 u = f(x)$ is known as..... equation.
- (d) Milne's Predictor formula is.....
- (e) The binary conversion to decimal number 2122013 is.....
- Q. 2. Answer all the questions given below:**
- (a) If $x = 2.536$, then find the absolute error and relative error when x is rounded to two decimal places and when x is truncated to two decimal places. (2½ Marks)
- (b) Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$. (2½ Marks)

Section B

Attempt any four questions out of the following six questions (Q.3 – Q.8).

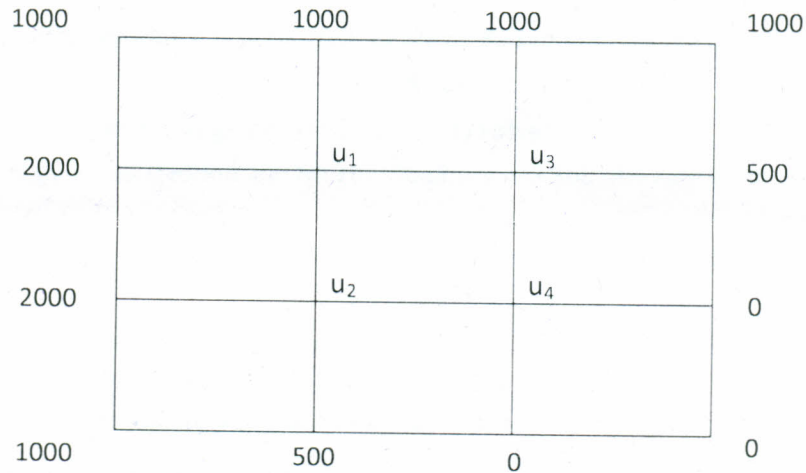
- Q. 3. Using Newton-Raphson method, find a root of the equation $x \sin x + \cos x = 0$ correct to three decimal places taking $x_0 = \pi$. (5 Marks)**
- Q. 4. Solve the system of equations $5x - y + z = 10$; $2x + 8y - z = 11$; $-x + y + 4z = 3$ upto six iterations by using Jacobi's Method starting with $(x_0, y_0, z_0) = (0, 0, 0)$. (5 Marks)**
- Q. 5. Use Stirling formula to obtain $f(32)$ given that**
- | | | | | | | |
|------|--------|--------|--------|--------|--------|--------|
| x | 20 | 25 | 30 | 35 | 40 | 45 |
| f(x) | 14.035 | 13.674 | 13.257 | 12.734 | 12.089 | 11.309 |
- (5 Marks)
- Q. 6. Find $\frac{dy}{dx}$ at $x = 1.5$, from the following data**
- | | | | | | |
|------|--------|--------|--------|--------|--------|
| x | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |
| f(x) | 0.3989 | 0.3521 | 0.2420 | 0.1295 | 0.0540 |
- (5 Marks)
- Q. 7. Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's $1/3$ and Simpson's $3/8$ rule. (5 Marks)**
- Q. 8. Given $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$, $h = 0.02$, find $y(0.02)$ and $y(0.04)$ using Modified Method of Euler. (5 Marks)**



Section C

Attempt all the questions given below.

- Q. 9. Given the values of $u(x, y)$ on the boundary of the square in the figure given below, evaluate the function $u(x, y)$ satisfying Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ on the pivotal points of this figure upto two iterations using Gauss Siedel iteration method.



(5 Marks)

- Q. 10. Use Runge-Kutta fourth order method to solve $\frac{dy}{dx} = -2xy^2, y(0) = 1, h = 0.2$ for $x = 0.2$.

(5 Marks)