Seat No:_____ Enrollment No:_____

PARUL UNIVERSITY

FACULTY OF APPLIED SCIENCE

M.Sc./ IMSc, Winter 2019-20 Examination

Semester: 1/7 **Date: 27-11-2019**
Subject Code: 11206103 **Time: 10:30 am to 01:00 pm**
Subject Name: Advanced Numerical Analysis **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) **(08)**

Find the eigen values of the matrix $A=\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$, using the power method up to five iteration.

Q.1. B) **(08)**

Using House-holder's method, reduce the matrix $A=\begin{bmatrix} 1 & 4 & 3 \\ 4 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$ to the tri diagonal form.

OR

Q.1. B) Apply Runge-Kutta 4th order method to find approximate value of y at $x=0.2$ given that **(08)**

$\frac{dy}{dx}=x+y^2$; $y(0)=1$, $h=0.1$

Q.2. A) Solve the Poisson equation $u_{xx}+u_{yy}=-81xy$, $0<x<1$, $0<y<1$ given that **(08)**

$u(0,y)=0, u(x,0)=0, u(1,y)=100$, $u(x,1)=100$, $h=\frac{1}{3}$.

Q.2. B) Answer the following questions (Any two)

(a) Solve $y'=x^2+y^2$; $y(0)=1$ by Taylor's series method. Hence find the values of y at $x=0.1$ **(03)**

(b) Using Euler's method, find an approximate value of y corresponding to $x=0.4$, given that $y'=x+y$; $y(0)=1$; $h=0.2$ **(03)**

(c) Find the eigen values of the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(03)**

Q.3. A) Apply Milne's Predictor Corrector method to solve $y'=x-y^2$ in the range $0\le x\le 1$ at $y(0)=0$. **(08)**

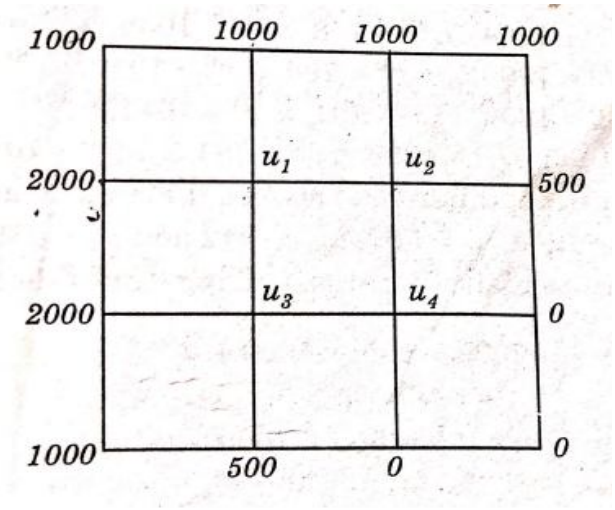
Q.3. B) Using Jacobi's method, find all eigen values and the eigen vectors of the matrix **(08)**

$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$

OR

Q.3. B) Given that $\frac{dy}{dx}=x+y^2$; $y(0)=1$ find an approximate value of y at $x=0.5$, by modified Euler's method. **(08)**

Q.4. A) Given the values of $u(x, y)$ on the boundary of the square in the below figure , evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of this figure by Gauss Seidel method **(08)**



Q.4. B) Find the eigen values and eigen vector using inverse power method of the matrix $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$ **(06)**

OR

Q.4. B) Apply Runge-Kutta 2nd order method to find approximate value of y at $x = 1.2$ given that **(06)**

$\frac{dy}{dx} = 3x + y \; ; \; y(1) = 1.3 \; , \; h = 0.1$