Reg. No.									

B.Tech. DEGREE EXAMINATION, MAY 2010

Fourth Semester

MA0202 – NUMERICAL METHODS

(For the candidates admitted from the year 2007-2008 onwards)

Time: Three hours — Max.Marks:100

PART – A (10 × 2 = 20 Marks)

Answer **ALL** Questions

1. Write down the normal equations used in fitting a straight line, using the principle of least squares.
2. State the criterion for the convergence in Newton-Raphson method and also state the order of convergence.
3. Express $y=2x^3-3x^2+3x-10$ is a factorial notation and hence show that $\Delta^3 y = 12$.
4. Prove that $\left(E^{1/2}+E^{-1/2}\right)(1+\Delta)^{1/2}=2+\Delta$.
5. Determine $f(x)$ as a polynomial in x for the following data, using Newton's divided difference formula.

x	–4	–1	0	2	5
$f(x)$	1245	33	5	9	1335

6. Using Trapezoidal rule, evaluate $\int_0^1 x^3\,dx$ considering five sub intervals.
7. State the formula for Runge-kutta fourth order method, to solve $y(0.2)$ $\frac{dy}{dx}=f(x,y),\ y(x_0)=y_0$.
8. State Milne's predictor corrector formulae.
9. Classify the partial differential equation of 2nd order, given $(1+x^2)\frac{\partial^2 u}{\partial x^2}+(5+2x^2)\frac{\partial^2 u}{\partial x\partial y}+(4+x^2)\frac{\partial^2 u}{\partial y^2}=0$.
10. Give an example of parabolic partial differenital equations.

PART – B (5 × 16 = 80 Marks)

Answer **ANY FIVE** Questions

11. i. Fit a parabola by the method of least squares, to the following data, estimate y at $x = 6$.

x	1	2	3	4	5
y	5	12	26	60	97

ii. Solve by Jacob's iteration method, the following equations: $20x + y - 2z = 17,\ \ 3x + 20y - z = -18,\ \ 2x - 3y + 20z = 25$

12. i. The table below gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface:

height x	100	150	200	250	300	350	400
distance y	10.63	13.03	15.04	16.81	18.42	19.9	21.27

Find the values of y when $x = 118$ *ft.* and 410 *ft.*

ii. Find the value of x corresponding to $y = 12$, using Lagrange's technique from the following data:

x	1.2	2.1	2.8	4.1	4.9	6.2
y	4.2	6.8	9.8	13.4	15.5	19.6

13. i. The following data gives the corresponding values of pressure and specific volume of a superheated steam:

ν	2	4	6	8	10
p	105	42.7	25.3	16.7	13

Find the rate of change of pressure with respect to volume when ν = 2.

ii. The velocity v *(km/min)* of a moped which starts from rest is given at fixed intervals of time t*(min)* as follows:

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Find the distance traveled by the moped in 20min.

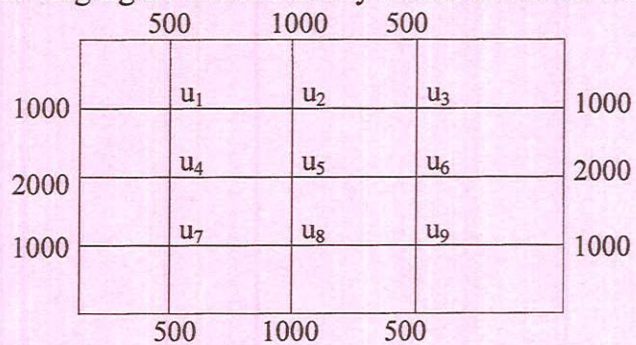
14. i. Find by Taylor's method, the value of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2y - 1,\ y(0) = 1$.

ii. Given $y' = x^2 - y,\ y(0) = 1$, find correct to four decimal places the value of y(0.1), by using improved Euler method.

15. Find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 y}{\partial x^2}$ and the boundary conditions $u(0,t) = 0 = u(8,t)$ *and* $u(x,0) = 4x - \frac{x^2}{2}$ at the points $x = i,\ \ i = 0,1,2,....8$ and $t = j,\ j = 0,1,2,....5$ using Bendre Schmidt's recurrence relation.

16. Solve the initial value problem $\frac{dy}{dx} = x - y^2,\ y(0) = 1$ to find $y(0.4)$ by Adam's method. Starting solutions required are to be obtained using Runge-Kutta method of order 4, step value being $h=0.1$.

17. Solve the elliptic equation $u_{xx}+u_{yy}=0$ for the square mesh of the following figure with boundary values as shown below:



* * * *