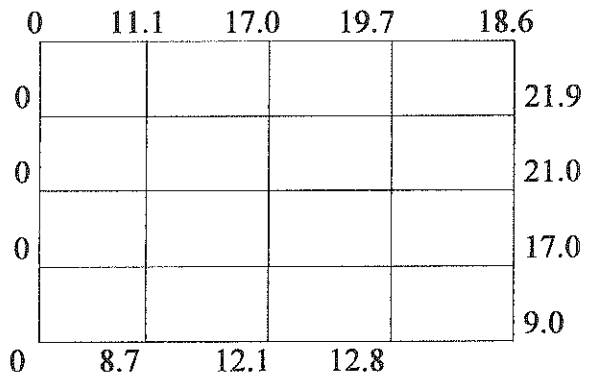
15. a. Solve $\nabla^2 u = 0$ at the mesh points of the square given below. The values of u at the boundary are specified in the figure.



(OR)

b. Solve $u_{xx} = u_{tt}$ given $u(0,t) = 0$, $u(4,t) = 0$, $u(x,0) = \frac{x(4-x)}{2}$ and $u_t(x,0) = 0$. Taking h = 1, find the solution upto 5 steps in t-direction.

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Reg. No.										

B.Tech. DEGREE EXAMINATION, NOVEMBER 2013
Fourth Semester

MA0202 – NUMERICAL METHODS
(For the candidates admitted from the academic year 2007-2008 to 2012-2013)

Time: Three hours Max. Marks: 100

Answer **ALL** Questions

PART – A (10 × 2 = 20 Marks)

1. Write Newton's formula to find the cube root of N.
2. Solve $3x+2y = 4$, $2x-3y = 7$ by Gauss elimination method.
3. Prove that $E\nabla = \nabla E = \Delta$.
4. Show that $\Delta_{bc}^2\left(\frac{1}{a}\right) = \frac{1}{abc}$
5. Find the slope of the curve which passes through the points (1,0), (2,1) and (4,5) at $x = 3$.
6. State the order of errors in trapezoidal rule and Simpson's rule.
7. Find $y(0.1)$ by Euler's method given that $\frac{dy}{dx} = 1-y$, $y(0) = 0$.
8. Write Adam Bashforth predictor-corrector formulae.
9. Classify the equation $f_{xx}+2f_{xy}+f_{yy} = 0$.
10. State Bender-Schmidt finite difference explicit scheme to solve $u_t = \alpha^2 u_{xx}$.

PART – B (5 × 16 = 80 Marks)

11. a. Given the following data,

x	0	1	2	3	4
y	1	5	10	22	38

Find the straight line and the parabola of best fit and calculate the sum of squares of the residuals in both cases.

(OR)

b. i. Find by Newton's method, the real root of $x\log_{10}x = 1.2$ correct to 4 decimal places.

ii. Solve the following system of equation using Gauss-Seidal method (3 decimal places)

$8x-3y+2z=20$

$4x+11y-z=33$

$6x+3y+12z=35$

12.a.i From the following table values of x and $f(x)$ determine f(0.23) and f(0.29).

x	0.20	0.22	0.24	0.26	0.28	0.30
$f(x)$	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

ii. Express the polynomial $12x^3-6x^2+5x-8$ as factorial polynomial with interval of differencing $h = 2$. Find the successive differences of the polynomial.

(OR)

b. i. Using Lagrange's interpolation formula, fit a polynomial to the following data and hence find $y(2)$.

x	0	1	3	4
y	–12	0	6	12

ii. Find $y(x)$ as a polynomial using Newton's divided different formula given the following table:

x	0	2	3	4	7	9
y	4	26	58	112	466	922

13.a.i Find the first and second derivatives of the function tabulated below at the point $x = 1.5$ and $x = 4.0$.

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.000	13.625	24.000	38.875	59.000

ii. Evaluate $\int_4^{5.2} \log_e x\,dx$ by (1) Trapezoidal rule (2) Simpson's 1/3 rule (3) Simpson's 3/8 rule.

(OR)

b. i. The following table gives the velocity of a particle at time t

t (sec)	0	2	4	6	8	10	12
v (metre/sec)	4	6	16	34	60	94	136

Find the distance moved by the particle in 12 sec and also the acceleration at t = 2 sec.

ii. Find the value of f''(3) using divided differences given the data

x	0	1	4	5
$f(x)$	8	11	68	123

14. a. Compute $y(0.4)$ by Milne's predictor-corrector method, given that $y' = x+y$, $y(0) = 1$ with $h = 0.1$. Use Taylor's series method to find the starting values.

(OR)

b. i. Solve $y' = 2xy$, $y(0) = 1$ by modified Euler's method, compute y(0.5) and y(1.0) taking h = 0.5

ii. Solve $y' = xy+1$ for $x = (0.2), (0.4)$ by Runge-Kutta method of fourth order, given that $y = 2$ when $x = 0$.