Reg. No.										

B.Tech. DEGREE EXAMINATION, MAY 2014
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. What is the order of convergence of Newton's method?
2. Solve: $3x+y = 2$, $x+3y = -2$ by Gauss Seidal iteration method.
3. Prove that $\mu = \frac{1}{2}\left[E^{\frac{1}{2}} + E^{\frac{-1}{2}}\right]$.
4. Using Lagrange's interpolation, find the polynomial through (0,0), (1,1) and (2,2).
5. Write Newton's forward difference formula to find $\left(\frac{dy}{dx}\right)_{x=x_0}$ and $\left(\frac{d^2y}{dx^2}\right)_{x=x_0}$
6. When does Simpson's rule give exact result?
7. Write down the Euler's algorithm to solve the ordinary differential equation of the first order.
8. How many prior values are required to predict the next value in Milne-Thompson method?
9. Define: Standard five point formula for solving Laplace equation using finite differences.
10. State what is the value of k to solve $\frac{\partial u}{\partial t} = \frac{1}{2}\frac{\partial^2 u}{\partial x^2}$, by Bender Schmidt method with $h = 1$, if h and k are the increments of x and t respectively.

PART – B (5 × 16 = 80 Marks)

11. a. Fit a straight line and a parabola to the following data: (correct to 2 decimal places)

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(OR)

b. i. Find the positive root of $cosx = xe^x$, by Newton's method by taking $x_0 = 0.5$ (correct to 4 decimals)

ii. By Gauss elimination method, find A^{-1} if $A = \begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$.

12. a. The following table gives the half-yearly premium for policies maturing at different ages. Estimate the premium for policies maturing at age 46 and 63. (correct to 4 decimal places)

Age (x)	45	50	55	60	65
Premium (y) (in lakhs)	114.84	96.16	83.32	74.48	68.48

(OR)

b. Find the polynomial $f(x)$, by using Lagrange's formula and hence find f(3) from

x	0	1	2	5
f(x)	2	3	12	147

13. a. Find the gradient of the road at the middle point of the elevation above a datum line of seven points of road which are given below: (correct to 6 decimal places)

x	0	300	600	800	1200	1500	1800
y	135	149	157	183	201	205	193

(OR)

b. Evaluate $\int_0^6 \frac{dx}{1+x}$, using Trapezoidal, Simpson's rule, correct to 4 decimal places.

14. a. Using Taylor's series method, find y when $x = 1.1$ and $x = 1.2$ from $\frac{dy}{dx} = x\,y^{1/3}$, given y(1) = 1 (correct to 4 decimals).

(OR)

b. By Adam's method, find y when $x = 0.4$, given $\frac{dy}{dx} = \frac{xy}{2}$, y(0) = 1, y(0.1) = 1.01, y(0.2) = 1.022, y(0.3) = 1.023 (correct to 4 decimals)

15. a. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t > 0$, given that $u(x,0)=20$, $u(0,t)=0$, $u(5,t) = 100$. Compute u for one-time step with $h = 1$, by Crank Nicholson method. (correct to 4 decimal places)

(OR)

b. Solve: $\nabla^2 u = -10(x^2+y^2+10)$ over the square mesh with sides $x = 0$, $y = 0$, $x = 3$ and $y = 3$ with $u = 0$ on the boundary and mesh length $h = 1$.

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