23459

Name: .....

Reg. No.: .....

FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2012

ME/AM 04 501 – COMPUTATIONAL METHODS IN ENGINEERING

Time : 3 Hours Maximum : 100 Marks

(Answer all questions)

Part A

I (a) Set up a Newton iteration for computing the root of a given positive member N and hence find $\sqrt{2}$ correct to 3 decimal places.

(b) If $g(x)$ is continuous [a,b] then under what condition the iterative method x = g(x) has a unique solution in $[a,b]$? Mention the importance of Graeffe's root squaring method.

(c) Apply Gauss-Jordan method to solve the equations $3x+4y=8$ and $4x+3y=7$.

(d) State the principle of relaxation method for solving a system of linear algebraic equations. What are the constraints of Crout's reduction method.

(e) Deduce Simpson's $1/3$ rd rule and $3/8$ th rule from Newton-Cote's quadrature formula.

(f) Use Newton's divided difference formula to find $f(x)$ from the following data.

x :	0	1	4	5
$f(x)$:	8	11	78	123

(g) Compare the Taylor's series and Runge-Kutta method. Give two disadvantages of Taylor's Series method.

(h) Using modified Euler's method solve $\frac{dy}{dx}=x^2+y$, $y(0)=1$ to find $y(0.2)$ and $y(0.4)$.

(8 x 5 = 40 Marks)

PART – B

II (a) (i) Find a real root of the equation $x\log_{10}x=1.2$ by Regula-Falsi method correct to 3 decimal places.

(ii) Apply Graeffe's root squaring method to solve the equation $x^3-8x^2+17x-10=0$.

(Or)

(b) (i) Find the real positive root of $3x-\cos x-1=0$ by Newton's method corrected to a decimal places.

(ii) Find the root of the equation $x=e^{-x}$ near $x=0.5$ correct to 4 places of decimals, using Chebyshev's method.

Turnover

III (a) (i) Solve by Gauss-Seidel method $8x-3y+2z=20,\ 4x+11y-z=33,\ \ldots\ldots$ $6x+3y+12z=35$.

(ii) Find the numerically largest eigen value of $A=\begin{bmatrix}1 & 1 & 3\\ 1 & 5 & 1\\ 3 & 1 & 1\end{bmatrix}$ by the power method.

(Or)

(b) (i) Solve the following system of equations by Crout's method:
$3x+2y+7z=4,\ 2x+3y+z=5,\ 3x+4y+z=7$

(ii) Solve the Jacobi's iteration method, the equations
$20x+y-2z=17;\ 3x+20y-z=-18;\ 2x-3y+20z=25$.

IV (a) (i) Find a polynomial $f(x)$ with the following data using Newton's divided difference formula.

x :	-4	-1	0	2	5
$f(x)$:	1245	33	5	9	1335

(ii) From the following table estimate the number of students who obtained marks between 40 and 45:

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

(Or)

(b) (i) Use Simpson's $1/3$ rd rule to find $\int_0^{0.6} e^{-x^2}\,dx$ by using seven ordinates.

(ii) Use Stirling's formula to evaluate $f(1.22)$ given

x :	1.0	1.1	1.2	1.3	1.4
$f(x)$:	0.841	0.891	0.932	0.963	0.985

V (a) (i) Use Runge-Kutta method of 4th order to find the value of y when $x = 1$, given that $y = 1$ when $x = 0$ and that $\frac{dy}{dx}=\frac{y-x}{y+x}$.

(ii) Using Adams-Bashforth method, obtain the solution of $\frac{dy}{dx}=x-y^2$ at $x = 0.8$, given the values

x :	0	0.2	0.4	0.6
y :	0	0.0200	0.0795	0.1762

(Or)

(b) (i) Apply Milnes Predictor corrector method find $y(0.4)$ given $\frac{dy}{dx}=1+xy^2,\ y(0)=1$ $y(0.1)=1.105,\ y(0.2)=1.223$ and $y(0.3)=1.355$.

(ii) Solve the boundary value problem $u_{tt}=u_{xx}$ with the conditions $u(0,t)$= u(lt) = 0 u(x,o) = $\frac{1}{2}x(1-x)$ and $u_t(x,0)=0$, taking $h=0.1$ for $0\le t\le 0.4$.

(4 x 15 = 60 Marks)

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