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D 51631 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B. TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2008

ME 04 501/AM 04 501—COMPUTATIONAL METHODS IN ENGINEERING

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Using the bireaction method, obtain a root of $x^3 - x - 1 = 0$.

(b) By Newton-Raphson Method, find a root of $x^4 - x - 10 = 0$ correct to three decimal places.

(c) By Gaussian elimination method,

Solve : $2x - 3y + z = -1$,
$x + 4y + 5z = 25$,
$3x - 4y + z = 2$.

(d) Explain the method of solving the system of non-linear equations by Newton-Raphson method.

(e) Construct a table of divided difference for the following data :

x :	0	2	3	5	6
y :	1	19	55	241	415

(f) By using Simpson's rule evaluate $\int_0^2 \frac{dx}{1+x^3}$ by dividing (0,2) into 6 equal parts.

(g) Using Taylor series method, solve $\frac{dy}{dx} = x + y$, $y(0) = 1$.

(h) Derive the finite difference formula for solving Laplace's equation.

[8 × 5 = 40 marks]

2. (a) By using Graeffe's root squaring method, find all the roots of $x^3 - 9x^2 + 24x - 20 = 0$.

(15 marks)

Or

(b) Beginning with the trial factor $(x^2 - 2x + 4)$, find the quadratic factor of $x^4 + 2.1x^3 - 3.42x^2 + 8.19x + 7.13 = 0$.

(15 marks)

3. (a) By using Gauss-Seidal iterative method, solve the equations

$10x + 2y + 6z = 28$
$x + 10y + 9z = 7$
$2x - 7y - 10z = -17$

Correct to three decimal places. (15 marks)

Or

Turn over

(b) Using Crout's method, solve the equations

$10x + y + z = 12$

$2x + 10y + 3z = 15$

$2x + 5y + 10z = 17$ (15 marks)

(a) Using Lagrange's interpolation formula, find the value of y corresponding to $x = 27$ from the following data :

x :	14	17	31	35
y :	68.7	64	44	39.1

(8 marks)

(b) The following table gives the values of x and y :

x :	1	1.05	1.1	1.15	1.2	1.25	1.3
y :	1.0	1.0247	1.049	1.07	1.095	1.118	1.14

Using Stirling's formula find y when $x = 1.12$. (7 marks)

Or

(c) Using numerical differentiation, find $\frac{dy}{dx}$ when $x = 2$ from the following :

x :	2	4	6	8	10
y :	10.5	42.7	25.3	16.7	13

(7 marks)

(d) Using the Trapezoidal rule, evaluate $\int_0^3 \frac{dx}{4x+5}$ by dissolving the range into 10 equal parts. (8 marks)

(a) Using Runge-Kutta method of fourth order, compute $y(0.1)$ and $y(0.2)$ if $y(x)$ satisfies

$\frac{dy}{dx} = \frac{1}{2}(1+x)y^2, y(0) = 1$. (7 marks)

(b) Using Adam's predictor-corrector formula, compute $y(0.4)$ and $y(0.5)$ if $y(x)$ satisfies $\frac{dy}{dx} = \frac{1}{2}xy$ and the data :

x :	0	0.1	0.2	0.3
y :	1	1.0025	1.0101	1.0228

(8 marks)

Or

(c) Find the solution of $2\frac{\delta u}{\delta t} - \frac{\delta^2 u}{\delta x^2} = 0$ when $u(0,t) = 0$ $u(4,t) = 0$, $u(x,0) = x(4 - x)$. Assuming $h = 1$, find the values of $u(x, t)$ upto $t = 5$. (15 marks)

[4 × 15 = 60 marks]