Reg.No : | | | | | | | | | | | |

D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE – 1

SEMESTER EXAMINATIONS

NOVEMBER – 2017 **15CPMA3E**

ELECTIVE : NUMERICAL ANALYSIS

Time: 3 Hrs **Max. Marks: 75**

SECTION – A (5 X 6 =30)

Answer ALL the questions.

1. (a) Solve the following quadratic equation, so as error due to subtraction of nearly equal numbers is minimized, using 3 digit arithmetic with rounding $x^2 + 99.8x - 20 = 0$.

(Or)

(b) Do three iterations of Secant method to find the root of $f(x) = x^3 - 3x + 1 = 0$, taking x_0=1, x_1=0.5.

2. (a) Solve the following system of equation by Crout's method, using 5 digit arithmetic

x_1+x_2-2x_3 = 2.5

4x_1-2x_2+x_3 = 5.5

3x_1 − x_2+ 3x_3 = 9.

(Or)

(b) Write the algorithm of Gauss – Elimination method.

3. (a) Find the interpolating polynomial in Lagrange form for the given data; hence interpolate f(-1)

x	-2	0	1	3
f	7	3	1	27

(Or)

(b) For the given data

X	0.2	0.4	0.6	0.8	1.0
F	3.2	3.6	2.8	3	2.4

Generate the table of forward differences and hence using backward form of interpolating polynomials, interpolate f(0.95).

4. (a) Evaluate the integral $\int_{-1}^{1} x^2 e^{-x} dx$ by composite Simpson's $\frac{1}{3}$ rule with spacing h=0.25

(Or)

(b) Evaluate $\int_{-1}^{2}\int_{1}^{3}(x^2 + y^2)dy\,dx (= 32\ by\ calculus)$, using composite Trapezoidal with spacing h=k=0.5 along x-axis and y-axis both.

5. (a) Do one step of Taylor's series method of order 2, to solve initial value problem $\frac{dy}{dx}$=xy^2+e^x, y(1)=4, spacing h=0.1.

(Or)

(b) Use second order Runge – Kutta method to compute values of y(0.1) and z(0.1) as solution of $\frac{dy}{dx} = y + z$ =f_1(x,y,z), y(0)=0 spacing h=0.1

$\frac{dz}{dx}$ = - yz = f_2 (x,y,z), z(0)= 1.

SECTION – B (3 X 15 =45)

Answer any THREE of the following questions.

6. Do three iterations of Newton's method to obtain the double root of $x^3-2x^2-0.75x+2.25=0$, which is close to 1, such that iterations converge quadratically.

7. Perform Gauss – Elimination on matrix A, with scaling, and partial pivoting, Store multipliers and pivotal vector. Use 5 digit arithmetic, then solve AX=b, $b=[15,37,-10]^T$ by back substitution where $\begin{bmatrix} 10 & 3 & 4 \\ 2 & -10 & 3 \\ 3 & 2 & -10 \end{bmatrix}$.

8. (a) prepare the forward difference table for the data

X	-1	0	1	2	3
F	10	2	0	10	62

Using Newton's forward interpolating polynomial, find approximate value of f(-0.5)

(b) Construct cubic spline interpolating polynomials for the data

X	-1	0	1	2
f(x)	2	4	2	8

9. Derive a two point Gaussian rule to evaluate the integral

$\int_0^1 \frac{g(x)dx}{\sqrt{x(1-x)}} = A_0g(x_0)+ A_1g(x_1)+\alpha g^{(iv)}(\xi)$, $0<\xi<1$, by generating the orthogonal polynomial set.

10. Solve the initial value problem,

$\frac{d^2y}{dx^2} + 4y = x, y(0) = 1, y'(0) = 2.25, h = 0.1$using fourth order Runge- Kutta method.

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