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2 PGDE MTH 4

2012

(Nov.-Dec.)

MATHEMATICS

Paper : 204

(Numerical Analysis)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer any *two* of the following :  $8 \times 2 = 16$

(a) Find the inverse of the following matrix :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 10 \end{bmatrix}$$

by Gauss-Jordan's method.

8

- (b) Describe Gauss-Seidel method to solve a system of linear equations. Also obtain the condition of convergency of this method.

$$6+2=8$$

- (c) Solve the following system of equations using LV-decomposition : 8

$$2x + y - z = 2$$

$$x + y + z = 3$$

$$x - 2y + z = 0$$

2. Answer any *two* of the following :  $2 \times 8 = 16$

- (a) What is the principle of Newton-Raphson method ? Give the geometrical representation of this method. Also obtain its order of convergence.  $3+2+3=8$

- (b) Solve  $x = 0.21 \sin (0.5 + x)$  by the iteration process (corrected upto four decimal places).

8

- (c) Describe Secant method to solve an equation. Is there any advantage of this method over Newton-Raphson method ? Explain.

$$6+2=8$$

3. Answer any *two* of the following :  $2 \times 8 = 16$

(a) Obtain Simpson's rule from general quadrature formula. What is the geometrical significance of Simpson's rule ?  $6+2=8$

(b) Obtain Cote's formulas. Show that its error term is of  $O(h^5)$ , where  $h$  is the length of the interval.  $5+3=8$

(c) Evaluate  $I = \int_0^{\pi/2} \sin x \, dx$  using Gaussian formula. What will be the error ?  $7+1=8$

4. Answer any *two* of the following :  $2 \times 8 = 16$

(a) Describe Milne's method of solving differential equations. Using Milne's method solve

$$\frac{dy}{dx} = x + y \quad \text{with } y(0) = 1 \text{ numerically.}$$

$$4+4=8$$

(b) Solve by Runge-Kutta method of fourth order

$$\frac{dy}{dx} = x^2 + y^2$$

with initial condition  $x_0 = 0, y_0 = 1$ . (Perform at least four steps.)  $8$

(c) What is the principle of Euler's method ? Give the geometrical interpretation of Euler's method. Write three drawbacks of Euler's method.  $2+3+3=8$

5. Answer any *two* of the following :  $2 \times 8 = 16$

(a) What is the two term recursion formula from which the members of the Chebyshev's polynomials can be obtained ? Find the first six Chebyshev polynomials from the recursion formula.  $6+2=8$

(b) What is the principle of least square approximation ? Obtain the normal equations assuming the functional relationship

$$y = a_0 + a_1x + a_2x^2 + a_3x^3 \quad 2+6=8$$

(c) Fit a curve of order 2 for the following set of data : 8

x	1.1	1.4	1.6	2	2.2	2.5
y	3.2	3.6	3.9	4.1	4.9	10