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2 PGDE MTH 4

2013

(December)

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 questions : 2×8=16

   (a) Describe Gauss-Elimination method to solve a system of linear equations. Also obtain the condition of convergency of this method. 6+2=8

(b) Solve the following system of equations using Gauss-Seidel method. 8

$$x+y+z=3$$

$$3x-y+z=2$$

$$x+y-3z=-1$$

(c) Describe Crout's decomposition method. If the principle minors of a matrix are singular then whether this factorisation is possible ? Is it unique in that case ? 6+1+1=8

2. Answer ***any two*** of the following questions. $2\times8=16$

(a) Write a short note on the method of false position explaining its geometrical interpretation advantages and disadvantages. 8

(b) What is the principle of bisection method ? If the function under consideration is not continuous, whether this method is applicable or not ? Find the of the equation $x^2+x-7=0$ by bisection method lying in the interval [2,3]. 1+1+6=8

(c) What is the main difference between Secant method and method of false position ? Find the rate of convergence of Secant method. 2+6=8

3. Answer ***any two*** of the following questions : 2×8=16

(a) Obtain Trapezoidal rule from general quadrature formula. Show that the error term in Trapezoidal rule is of order h^3. 5+3=8

(b) Evaluate $I = \int_0^3 (2x - x^3)dx$ taking 6 intervals by Simpsa's $1/3$ rd rule. Also compare this result with actual value. 6+2=8

(c) Evaluate $I = \int_0^1 \frac{dx}{1+x^2}$ by Weddle's rule. Hence find an approximate value of π. 6+2=8

4. Answer ***any two*** of the following questions. $2\times8=16$

(a) Obtain the values of K_1, K_2, K_3 and K_4 by comparing *R-K* fourth order formula with Jaylor's expansion. 8

(b) Find the values of $y(0.1)$ and $y(0.2)$ from the following differential equation 8

$$\frac{dy}{dx}=x^2+y^2 \text{ with } y(0)=1$$

by Euler's method.

(c) Obtain the formula of Milne's method. Show that its error term is of $0(h^5)$ where h is the length of the intervals. 6+2=8

5. Answer ***any two*** of the following questions : $2\times8=16$

(a) Use least square method to fit the line $y=a+bx$ bases on the sample $(2,1)$, $\left(\frac{1}{6},-\frac{5}{6}\right)\left(-\frac{3}{2},-2\right)$ and $\left(-\frac{1}{3},-\frac{2}{3}\right)$. 8

(b) Approximate $f(x)=c^x$ to second order Chebyshev approximation over the interval [0,1].

(Hint : The Chebyshev nodes are given by

$$x_j = Cos\left(\frac{(2j+1)\pi}{6}\right),\ j=0,1,2)$$

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(c) Fit a curve of the form $y=ae^{-bx}$ for the data given below.

x	:	0.5	1.0	1.5	1.6	1.8	1.9	2.0
y	:	2.1	3.4	3.9	4.8	5.1	5.8	6.0

(Hint : Let the exponential curve be $y = ae^{-bx}$. Now take logarithm on both sides.)

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