July 2009

Bachelor of Computer Application (BCA) Examination

VI Semester

Computer Oriented Numerical Methods

Time : 3 Hours] [Max. Marks : 50

Note- Solve any two parts from each question. All questions carry equal marks.

1. (a) Derive the formula for Secant method and then find the roots of following polynomial equation $x^2 - x - 1 = 0$
   (b) Obtain all the roots of following equation by squaring three times using Graffes root squaring method.
   (c) Under what Circumstance Newton-Raphson Method will not converge to root? How you will obtain its modified algorithm under these circumstances?
2. (a) Obtain the normal equation for fitting of parabola $y = a + bx + cx^2$ using Least Square Principle. Then write algorithm/c-rdutine for fitting of parabola.
   (b) What are ill-conditioned equations? Write successive refinement procedure for improving solution of ill conditioned equations.
   (c) Compare Gauss-Jordan method with Gauss Elimination process. Which is efficient algorithm based on triangularization or diagonalization? Justify your answer.
3. (a) For unequal sub-intervals which interpolation method is best suited? When divided difference interpolation is better then Lagrangees interpolation? Compare both algorithms.
   (b) Derive Newton's forward interpolation formula. Write algorithm for this technique.
   (c) Prove that sum of Lagrangee's coefficients is unity.
4. (a) Derive Simpson's 1/3 formula from Newton-Cote's formula. Then evaluate following integral to find value of π using Simpson's 1/3 rule -

$$\int_0^1 \frac{dx}{1+x^2};\ n = 6$$

   (b) What is general quadrature formula? Derive it, then derive Simpson's 3/8 rule.

(b) Derive the formula for Simpson's 3/8 rule and also write program for it.

(c) Derive the formula for Newton's divided difference interpolation formula.

5. (a) Given that $y' = \log (x + y)$ with $y(0) = 1$ use modified Euler's to find $y(0.2)$.

(b) Derive the formula for Runge-Kutta 4th order method and write a C program for it.

(c) Using Taylor's series expansion tabulate the solution $x = 4$ to $x = 4.4$ in step of 0.1 of differential equation.

$$5xy' + y^2 - 2 = 0 \text{ with } y(u) = 0$$

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