May 2015

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) Find the smaller root of the equation $x^2 - 40\,0x + 1 = 0$ using four digit arithmetic.
   (b) Prove that Bisection method always converges.
   (c) Write an algorithm to find the roots of an equation using Graffes root squaring method.
2. (a) Show that the following system of equations is ill- conditioned :
   $$x - 2y = -2$$
   $$.45x - .92y = -1$$
   (b) Solve the following system of equations using LU decomposition method.
   $$x_1 + x_2 - x_3 = 2$$
   $$2x_1 + 2x_2 + 5x_3 = -3$$
   $$3x_1 + 2x_2 - 3x_3 = 6.$$
   (c) Write an algorithm to implement curve fitting to fit a straight line.
3. (a) Prove that :
   (i) $E^{1/2} = \mu + \frac{1}{2}\delta$ (ii) $\delta = \Delta\,(1 + \Delta)^{-1/2} = \nabla(1 - \nabla)^{-1/2}$.
   (b) Write a C program to implement Newton's forward method of interpolation.
   (c) The population of a town is as follows :

Year	1921	1931	1941	1951	1961	1971
Population (in Lakhs)	20	24	29	36	46	51

   Estimate the increase in population during the period 1955 to 1961.
4. (a) Write an algorithm to implement Newton's divided difference interpolation formula.
   (b) The river is 80 m wide. The depth 'y' of the river at a distance 'x' from one bank is given by the following table :

x :	0	10	20	30	40	50	60	70	80
y :	0	4	7	9	12	15	14	8	3

Find the approximate area of cross-section of the river using Simpson's 1/3 rule.

(c) By means of Lagrange's formula, prove that :

(i) $y_0 = \frac{1}{2}(y_1 + y_{-1}) - \frac{1}{8}\left[\frac{1}{2}(y_3 - y_1) - \frac{1}{2}(y_{-1} - y_{-3})\right]$

(ii) $y_1 = y_3 - 0.3\,(y_5 - y_{-3}) + 0.2(y_{-3} - y_{-5})$

5. (a) Given $\frac{dy}{dx} = \frac{y - x}{y + x}$ with $y = 1$ for $x = 0$. Find the value of y approximately for $x = 0.1$ by Euler's method.

(b) Discuss Taylor's series method in detail along with its disadvantages. n (c) Given $\frac{dy}{dx} = x - y^2$, $y(0) = 0$, calculate $y(0.2)$ by Picard's method to third approximation and round off the value at 4th place of decimals.

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