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BCS-054

BACHELOR OF COMPUTER APPLICATIONS (BCA) (REVISED)

Term-End Examination

June, 2020

BCS-054 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 Hours *Maximum Marks : 100*

Note : (i) *Any calculator is allowed during examination.*

(ii) *Question No. 1 is compulsory. Attempt any* ***three*** *questions from Question No. 2 to* ***5.***

1. (a) Write formulas for absolute error and relative error. If the represented value of X_1 is 3.1428 and its actual value is X_1 = 3.14285, find absolute and relative errors. 4

P. T. O.

(b) Solve the following system of linear equations using Gauss Elimination method : 5

$$X_1 + X_2 + X_3 = 3$$

$$4X_1 + 3X_2 + 4X_3 = 11$$

$$9X_1 + 3X_2 + 4X_3 = 16$$

(c) Use Newton-Raphson method performing only 2 iterations, to find a root of the equation $x^3 - 2x - 5 = 0$ near the value 2. 5

(d) Prove that : 3

$$\Delta = E - 1$$

(e) Using the data given below find $f(2)$ by using the Lagrange's interpolation method : 6

x	$f(x)$
0	2
1	6
3	8

(f) Calculate the value of the Integral $\int_2^3 x^2 dx$ by using Simpson's 1/3 rule, taking $h = 0.2$. 6

(g) Given that $y' = x^2 + y$ and $y(0) = 1$, determine the value of y when $x = 0.1$, using the Euler's method. 6

(h) Assume that a floating point representation is of eight decimal digits with four digits for normalised mantissa, two digits for exponent and one digit each for sign of exponent and mantissa. Answer the following, using this representation (use chopping if required). 1, 1, 1, 2

(i) – 35678

(ii) + 0.0035622

(iii) Addition of numbers given in (i) and (ii) above

(iv) Multiplication of numbers given in (i) and (ii) above.

2. (a) Solve the following system of equations by using Gauss-Seidel iteration method. Perform only two iterations taking $x = y = z = 0$ as the initial approximation : 8

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

$$6x + 3y + 12z = 35$$

(b) Find a root of the equation : 8

$$x^3 - 2 = 0$$

using the Regula-Falsi method. Perform only two iterations.

(c) Define the order and degree of a differential equation. Find the order and the degree of the equation : 4

$$\frac{d^3y}{dx^3} + \left(\frac{dy}{dx}\right)^6 = 0$$

3. (a) Using Newton's forward interpolation formula on the table of values given below, obtain the value of y when $x = 0.4$: 7

x	y
1.1	0.21
1.3	0.69
1.5	1.25
1.7	1.89
1.9	2.61

(b) Evaluate $\int_1^3 \frac{dx}{1+x}$ by subdividing the interval (1, 3) into 8 equal parts and using Trapezoidal rule. 6

(c) Solve the following system of equations by using Gauss-Jacobi's iteration method : 7

$$8x + y + z = 8$$

$$2x + 4y + z = 4$$

$$x + 3y + 5z = 5$$

Perform any two iterations.

P. T. O.

4. (a) Apply Newton's backward difference interpolation formula to find $f(x)$ from the following data. Also compute $f(2.5)$: 7

x	$f(x)$
0	4
2	24
4	39

(b) Solve the following system of linear equations using Gaussian elimination method using pivotal condensation : 10

$$3x - 2y + 6z = 17$$

$$6x - y + z = 9$$

$$2x + 12y - z = -12$$

(c) Explain, how the fixed point method for solving non-linear equations is related to Newton-Raphson method. 3

5. (a) Evaluate $\int_0^1 e^{-x^2} dx$, using Rectangle rule by taking $h = 0.5$. 5

(b) Find the smallest positive root of the equation $x^3 - 3x - 5 = 0$ using the Bisection method. Perform only three iterations. 6

(c) Write the symbol and formula with respect to $f(x)$ and h for the following operators : 4

(i) Central difference

(ii) Averaging operator

(d) Explain the concept of overflow and underflow in the context of floating point decimal number representation with the help of *one* example of each. 5