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BCS-054

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

04872

Term-End Examination

June, 2017

BCS-054 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours *Maximum Marks : 100*

Note :

(i) Calculator, including scientific, is allowed during examination. However, each step of numerical calculation should be explicitly carried out by the examinee.

*(ii) Question no. 1 is **compulsory**. Attempt any **three** from the rest of the four questions.*

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1. (a) Calculate x – y, for the following two floating-point numbers : 3

$$x = 0{\cdot}8706 \times 10^{-3},\ y = 0{\cdot}7604 \times 10^{-2}$$

(b) Find the product of x and y given in (a) above. 3

(c) Explain what is 'overflow', with a suitable example of multiplication. 4

(d) Write the following system of linear equations in matrix form : 3

$$-9x + 17y = -8$$

$$12x = 23$$

(e) Solve the following system of linear equations using Gauss elimination method : 4

$$-7x + 5y = 3$$

$$2x - 8y = -12$$

(f) Find an interval in which the following equation has a root : 3

$$2x^2 + 6x - 7 = 0$$

(g) Write briefly the steps of the Secant Method to find out the roots of an equation. 4

(h) Write the expressions which are obtained by applying each of the following operators to f(x) : 4

(i) ∇

(ii) Δ

(i) Write Δ in terms of each of (i) E and (ii) δ separately. 3

(j) Construct the difference table for the following data : 3

x	2	7	11	17	23
f(x)	17	32	49	73	143

(k) State the following two formulae for interpolation (for equal intervals) : 4

(i) Stirling's Formula

(ii) Newton's Backward Difference Formula

(l) Explain the concepts of 'order' and 'degree' of a differential equation, with an example. 2

2. (a) Using either Gauss-Jacobi iterative method or Gauss elimination method with partial pivoting, solve the following system of linear equations : 15

$$3x - 5y + 6z = 11$$

$$5x - 11z = -28$$

$$2y + 9z = 31$$

(b) Discuss the merits and demerits of direct approach over iterative approach for solving a system of linear equations. 5

3. (a) For $f(x) = 4x^3 - 3x^2 + 8$, find $\Delta^3 f(x)$ in terms of h, where h is an equally spaced interval. 8

(b) Estimate the missing term in the following data using FD (Forward Difference) assuming that the data is a valid representation of a polynomial of degree 3. 12

x	1·00	1·20	1·40	1·60	1·80
f(x)	2·7183	?	4·0552	4·9530	6·049

4. Attempt any ***two*** parts of (a), (b) and (c) below :

(a) Approximate the value of $\int_3^4 \frac{dx}{4-3x}$ using the Trapezoidal rule, using five equal parts of the interval [3, 4]. *10*

(b) Using Euler's method, tabulate the solution of the Initial Value Problem (IVP) $y' = -3ty^2$, $y(0) = 1$ in the interval [0, 1], using $h = 0{\cdot}2$. *10*

(c) From the data given in the table below, find $y' = \frac{dy}{dx}$ at $x = 2{\cdot}75$ using Forward Difference. *10*

x	1·5	2·0	2·5	3·0	3·5
y = f(x)	1·2247	1·4142	1·5811	1·7320	1·8708

5. (a) Using 8-decimal digit floating-point representation (4 digits for mantissa, 2 digits for exponent, and one each for sign of exponent and mantissa), represent the following numbers (use chopping, if required) : *4*

(i) $-76{\cdot}384$

(ii) $0{\cdot}00079542$

(b) Is '+' associative when $a = 0{\cdot}2134 \times 10^5$; $b = 0{\cdot}2354 \times 10^3$ and $c = -0{\cdot}2142 \times 10^1$ are three floating-point numbers to be added, in this order ? You are required to find out whether $(a + b) + c = a + (b + c)$. *10*

(c) Explain the following two concepts with a suitable example for each : *6*

(i) Chopping error

(ii) Rounding error