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BCS-054

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

Term-End Examination

01091

December, 2017

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** more from the next four questions.*

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1. (a) Find the sum of two floating-point numbers $x_1 = 0{\cdot}4325 \times 10^2$ and $x_2 = 0{\cdot}3507 \times 10^3$. *2*

(b) Find the product of x_1 and x_2 given above in (a). *2*

(c) Explain what is 'Overflow'. Give an example of multiplication due to which overflow occurs. *3*

(d) Write the following system of linear equations in matrix form : *2*

$$-8x + 7y = 15$$

$$12x - 8y = 4$$

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

$$5x - 3y = 7$$
$$-7x + 15y = 1$$

(f) Find an interval in which the following equation has a root : 2

$$x^2 - 9x + 19 = 0$$

(g) Write the formula of Newton-Raphson method for finding root of an equation. 3

(h) Write the expressions which are obtained by applying each of the following operators : 3

(i) ∇

(ii) δ

(iii) Δ

(i) Write ∇ and δ in terms of E. 3

(j) State the following two formulae for interpolation : 4

(i) Bessel's Formula

(ii) Newton's Forward Difference Formula

(k) Construct a difference table for the following data : 2

x	1	4	7	10
f(x)	6	10	14	18

(l) From the Newton's Forward formula asked in j(ii) above, derive a rule/formula for finding derivative of a function f(x) at $x = x_0$. 3

(m) State Trapezoidal rule for finding the value of the integral $\int_a^b f(x)\,dx$. 3

(n) Define each of the following concepts with one suitable example for each : 4

(i) Differential Equation

(ii) Initial Value Problem

2. (a) Using 8-decimal digit floating point representation (with four digits for mantissa, two digits for exponent and one each for sign of exponent and mantissa), represent the following numbers in normalized floating point form (use chopping, if required) : 3

(i) 8795

(ii) – 798·78

(iii) – 0·0087456

(b) For each of the three numbers in Q. No. 2(a), find relative error in its normalized floating point representation. 6

(c) Find the approximate value of 'e' by taking first three terms of Maclaurin's series and also find truncation error. 5

(d) Obtain the smallest positive root of the equation $x^3 - 5x + 1 = 0$, by using three iterations of bisection method. 6

3. (a) Discuss relative merits and demerits of each of (i) direct methods, and (ii) iterative methods of solving a system of linear equations, w.r.t. each other. 4

(b) Solve the following system of linear equations using Gaussian elimination method, and comment on the nature of the solution : 6

$$12x + 18y - 5z = 25$$

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

$$9x + 23y - 12z = 20$$

(c) Solve the following system of linear equations with partial pivoting condensation Gaussian elimination method : 10

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

$$2x + y + 4z = 7$$

$$3x + 5y - 2z = 6$$

4. (a) For $f(x) = 6x^2 + 8x + 9$, find $\Delta^3 f(x)$. *6*

(b) Estimate the missing term in the following data, using Forward Difference : *8*

x	100	101	102	103	104
log x	2·000	2·0043	?	2·0128	2·0170

(c) Derive the operators E and Δ in terms of δ. *6*

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

(a) Find the approximate value of $\int_2^3 \frac{dx}{1+x}$ using Trapezoidal rule, with $h = 0{\cdot}25$. *10*

(b) Find $f'(x)$ at $x = 0{\cdot}1$ from the following table of values : *10*

x	0·2	0·3	0·4	0·5	0·6
f(x)	1·2214	1·3498	1·4918	2·56	3·02

(c) Using Euler's method to find the solution of $y' = t + y$ given $y(0) = 1$, find the solution on the interval [0, 0·8] with $h = 0{\cdot}2$. The independent variable is t. *10*