BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

Term-End Examination

December, 2016

05116

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 rest of the four questions.*

1. (a) Find the sum of two floating point numbers $a = 0.5403 \times 10^3$ and $b = 0.7182 \times 10^4$.   *3*

(b) Find the product of the two numbers a and b given above.   *3*

(c) Define what is 'underflow'. Give an example of multiplication due to which underflow occurs.   *4*

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

$$8x + 11y = 19$$
$$12x + 5y = 17$$

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

$$5x - 3y = 7$$
$$-2x + 9y = 5$$

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

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

(g) Write briefly the steps of bisection 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) δ

(ii) ∇

(i) Write E in terms of each of ∇ and δ separately. *3*

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

x	1	5	9	13
f(x)	5	17	29	41

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

    (i)   Newton Forward Difference Formula

    (ii)   Bessel's Formula

(l) Explain the concept of 'Initial Value Problem' with an example. *2*

2. (a) Solve the following system of linear equations, using partial pivoting : *15*

$$4x_1 - 5x_2 + 6x_3 = -24$$

$$x_1 + 3x_2 - 5x_3 = 22$$

$$-2x_1 + 8x_2 + x_3 = 11$$

(b) What are the relative advantages of iterative methods over direct methods for solving a system of linear equations ? *5*

3. (a) For $f(x) = 3x^3 + 11x - 5$, find $\nabla^3 f(x)$ in terms of h, where h is an equally spaced interval. *8*

(b) Estimate the missing term in the following data using backward difference assuming that the data is a valid representation of polynomial of degree 3 : *12*

x	1·20	1·40	1·60	1·80	2·00
f(x)	3·3201	4·0552	4·9530	?	7·3891

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

(a) Find f'(x) at x = 0·25 from the following table of values : *10*

x	0·2	0·3	0·4	0·5	0·6
f(x)	2·1082	2·8706	3·4013	3·9121	4·3012

(b) Find the approximate value of $\displaystyle\int_{2}^{3} \frac{dx}{3+4x}$,

using Trapezoidal rule, with 5 equal parts of [2, 3]. *10*

(c) Using Euler's method to find the solution of dy/dx = 3x + y, given y(0) = 3, find the solution on the interval [0, 0·8] with h = 0·2, where x is the independent variable and y is the dependent variable. *10*

5. (a) Using the 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 in normalized floating point form : *4*

(i) – 98·37

(ii) 0·000893

(Use chopping, if required)

(b) Using the 8-decimal digit format stated in Q5(a) above, briefly discuss how zero is represented as a floating point number. **6**

(c) Let $a = 476 \cdot 9 \times 10^6$, $b = 657 \cdot 2 \times 10^4$ and $c = -5 \cdot 342 \times 10^4$. Find out whether '+' is associative for a, b and c (i.e., you are required to find out whether

$(a + b) + c = a + (b + c)$ or not). **10**

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