02874

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

December, 2013

BCS-054 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours *Maximum Marks :* **100**

Note : *(i) Simple (but not scientific) calculator is allowed during examination.*

(ii) Question number **1** *is* **compulsory.** *Attempt* **any three** *from the next* **four** *questions.*

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1. (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 in normalized floating point form : **3**

(i) -47.65

(ii) 0.00658

(iii) -98674

(use chopping, if required)

(b) Find the sum of two floating numbers $x_1 = 0.3425 \times 10^2$ and $x_2 = 0.5307 \times 10^3$. **2**

(c) Find the product of two numbers in (b) above **2**

(d) What is overflow ? Give an example of multiplication due to which overflow occurs. **3**

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

$$-3x + 5y = 11$$
$$9x + 14y = 3$$

(f) Solve the following system of linear equations using Gauss elimination method : 3

$$2x + 5y = 9$$
$$4x + 3y = 11$$

(g) Find an interval in which, the following equation has a root $x^2 - 5x + 6 = 0$ 2

(h) Write briefly the steps of bisection method to find roots of an equation 3

(i) Write the expressions which are obtained by applying each of the following operators to $f(x)$, for some : 3

(i) Δ (ii) ∇ (iii) δ

(j) Write ∇ and δ in terms of E 2

(k) State the following two formulae for interpolation 3

(i) Newton's Backward difference formula

(ii) Bessel's formula

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

x	1	3	5	7
$f(x)$	4	6	8	10

(m) From the Newton's Backward formula asked in part k(i) derive rule / formula for finding derivative of a function $f(x)$ at x_0 3

(n) State Simpson's rule for computing $\int_a^b f(x)\,dx$ 3

(o) Define each of the concepts with suitable examples 4

(i) Differential Equation

(ii) Initial value problem

2. (a) Briefly discuss how zero is represented as a floating point number for the 8-decimal digit representation mentioned in Q.No. 1(a). **4**

(b) For each of the following numbers find floating point representation, if possible normalized, using rounding , if required. The format is 8-decimal digit as is mentioned under Q.No. 1(a) : **6**

(i) 7854302 (ii) $2\frac{2}{3}$

Find absolute error, if any, in each case.

(c) Let $a = 476.9 \times 10^6$, $b = 657.2 \times 10^4$ and $c = -5.342 \times 10^4$ Find out whether '+'is associative for a, b and c ? (i.e, you have to find out whether $(a+b) + c = a + (b+c)$or not ?) **10**

3. (a) Solve the following system of linear equations, using partial pivoting : **12**

$$2x_1 - 3x_2 + 5x_3 = 4$$
$$x_1 + 5x_2 - 4x_3 = 2$$
$$4x_1 + 3x_2 - 7x_3 = 0$$

(b) For solving a system of three linear equations, how the two iterative methods, viz. Gauss-Jacobi method and Gauss-Seidel method differ from each other. **4**

(c) What are the relative advantages of direct methods over iterative methods for solving a system of linear equations ? **4**

4. (a) For $f(x)=5x^2+7x+8$, find $\Delta^3 f(x)$. **6**

(b) Estimate the missing term the in the following data using FD (Forword Difference) : **8**

x	100	101	102	103	104
log (x)	2.000	2.0043	?	2.0128	2.0170

(c) Use Linear Interpolation to find $f(0, 4)$ for $f(x) = 6^x$ **6**

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

(a) Find $f'(x)$ at $x = 0.1$ from the following table of values : **10**

x	0.1	0.2	0.3	0.4	0.5
$f(x)$	1.1051	1.2214	1.3498	1.4918	2.56

(b) Find approximate value of $\int_1^2 \frac{dx}{1+x}$ using trapezoidal rule using n = 1 **10**

(c) Using Euler's method to find the solution of $y' = t + y$, given $y(0) = 1$ find the solution on interval [0, 0.8] with h = 0.2. The independent variable is t. **10**