No. of Printed Pages : 4

BCS-054

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2014

03753

BCS-054 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

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

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

*(ii) Question No. **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 for exponent and one each for sign of exponent and mantissa), represent the following numbers in normalised floating point form : **3**

(i) 89.36

(ii) -0.00004375

(iii) 87604

(use chopping, if required)

(b) Find the sum of two floating numbers $x_1 = .5307 \times 10^4$ and $x_2 = .4252 \times 10^3$ **2**

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

(d) What is underflow ? Give an example of multiplication in which underflow occurs. **3**

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

$$5x - 9y = 14$$
$$2x + 5y = 11$$

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

$$3x + 4y = 11$$
$$x + 3y = 7$$

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

$$x^2 - 7x + 12 = 0$$

(h) Write formula used in Newton - Raphson method for finding the roots of an equation. 3

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

(i) δ (ii) E (iii) μ

(j) Write Δ and δ in terms of E. 2

(k) State the following two formulae for interpolation : 3

(i) Newton's Forward difference formula

(ii) Stirling's formula

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

x	1	2	3	4
$f(x)$	1	4	9	16

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

(n) State Trapezoidal rule for finding the integral $\int_a^b f(x)\,dx$ 3

(o) Define each of the concepts with suitable example. 4

(i) Degree and order of a differential equation

(ii) Initial Value Problem

2. (a) Explain the advantages of normalized floating point number over un-normalized numbers. 4

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

(i) $\frac{1}{3}$ (ii) 987668

Find absolute error, if any, in each case.

(c) Let $a = 234.5 \times 10^3$, $b = 4.789 \times 10^3$ and $c = -6.903 \times 10^1$ 10

Find out whether '+' is associative or not for a, b and c ? (i.e. you have to find out whether $(a+b)+c = a+(b+c)$ or not ?

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

$-3x_1 + 5x_2 - x_3 = 1$

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

$x_1 + x_2 - 2x_3 = 0$

(b) For solving a system of linear equations : 4

$a_{11}\, x_1 + a_{12}\, x_2 + a_{13}\, x_3 = b_1$;

$a_{21}\, x_1 + a_{22}\, x_2 + a_{23}\, x_3 = b_2$ and

$a_{31}\, x_1 + a_{32}\, x_2 + a_{33}\, x_3 = b_3$, by iterative Gauss-Jacobi Method, with initial approximations, $x_1 = 0 = x_2 = x_3$, give formulas for next approximations of x_1, x_2 and x_3.

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

4. (a) For $f(x)=7x^2-3x+11$, find $\Delta^3 f(x)$. 6

(b) Construct a difference table and mark the forward differences for the following data : 8

x	1	2	3	4	5
$f(x)$	7	15	20	26	35

(c) Given $f(x)=\sin x$, 6
$f(0.1)=0.09983$ $f(0.2)=0.19867$; use the method of linear interpolation to find $f(0.17)$.

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

(a) The values of $y=\sqrt{x}$ are given below for 10
$x=1.5(0.5)3.5$.

x	1.5	2.0	2.5	3.0	3.5
$\sqrt{x}$	1.2247	1.4142	1.5811	1.7320	1.8708

Find y' at $x=2.20$ using FD formula.

(b) Find approximate value of $\int_2^3 \frac{dx}{1+x^2}$, using 10
trapezoidal rule using n=1.

(c) We are given the Initial Value Problem (IVP) 10
$y'=1-2xy$, $y(0.2)=0.1948$ with $h=0.2$, using Euler's Method, find $y(0.4)$. The independent variable is x.