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**University Examinations 2015/2016**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMAICS AND COMPUTER SCIENCE

**CCS 3275: SCIENTIFIC COMPUTING**

**DATE: NOVEMBER 2015 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Computational science and engineering is a rapidly growing multidisciplinary area with connections to mathematics, computer science and engineering. Provide a justification for this statement. (8 Marks)
2. Evaluate the expression **a+2>b&&!c||a!=d&&a-2<=e**

Where a=11, b=6, c= 0, d= 7 and e=5, show the evaluation at each step. (4 Marks)

1. Given a=55.50e00, b=4.545e01 and c=0.4535e02, Find b(a-c) using normalized floating point with a 6 bit hypothetical computer in which 4 bits are for mantissa and two bits are reserved for exponent.

(4 Marks)

1. Define the following types of constants and give two examples of each
2. Floating point constants (2 Marks)
3. Escape sequence characters (2 Marks)
4. What is the output of the program segment? Explain by tracing the segment. (4 Marks)

**int p=7;**

**float q=2;**

**float r;**

**r=p/q;**

1. Define the following terms as applied in programming
2. Orthogonally (2 Marks)
3. Programming paradigm (2 Marks)
4. Explore the influence of the following on programming language design

i) Computer architecture (2 Marks)

ii)Programming methodologies (2 Marks)

**QUESTION TWO (20 MARKS)**

1. Using a suitable illustrative process diagram, explain the phases of the compilation process.

(6 Marks)

1. The choice of a given programming language should be based on specific benchmarks. Identify five benchmarks and justify their relevance. (10 Marks)
2. What is the range of signed and unsigned numbers for

i) a 16-bit machine (2 Marks)

ii) a 8-bit machine (2 Marks)

**QUESTION THREE (20 MARKS)**

1. An important aspect of scientific computing is the understanding of errors made during computation of solutions. Using a diagram explain an overview of errors made in scientific computing. (8 Marks)
2. Explain how the evaluation is done for the expression 8/3 to get the answer as 2.666... Using explicit type conversion. (3 Marks)
3. Given the expression below, perform the hierarchy of computation and mention and mention the type of the operator, hence determine the value of a given that the initial value of a=5

**i) a + =(a++)+(++a)**

**ii) a = (--a)-(a--)**

1. Find the values of the variables in the following program segments by tracing them out.(5 Marks)

int a, b, c; int a, b;

float x, y; float c;

a=10; a=25/10+6.5;

b= 15; b=25/10+6.6;

c=b/a; c=25/10+6.6;

x=b/a;

y=(float)b/b;

**QUESTION FOUR (20 MARKS)**

1. Given **three** sides of a triangle, check whether the triangle can be formed or not? If it can be performed, identify the type of triangle i.e. whether it is equilateral, isosceles or triangle. Further, it should be established if the triangle is right angled. Write a C language program to implement tasks. (8 Marks)
2. Given hypothetical machines of word length 3-bits, 4-bits, 5-bits, Derive the expression for finding the maximum and minimum numbers that can be represented using signed and unsigned notations, in a computer memory. (8 Marks)
3. Identify the **two** classes of I/O functions and distinguish between them using relevant examples in program segments. (4 Marks)

**QUESTION FIVE (20 MARKS)**

Describe the design process, overview and evaluated of the following programming languages.

i) PASCAL (4 Marks)

ii) SMALLTALK (4 Marks)

1. ADA (4 Marks)
2. FOTRAN (3Marks)
3. What is type declaration? Give the explanation along with the syntax. (1 Mark)
4. With the help of an example, explain the following functions
5. Getchar() (2 Marks)
6. Puchar() (2 Marks)