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**University Examinations 2014/2015**

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MATHEMATICS AND COMPUTER SCIENCE

**CCS 3275: SCIENTIFIC COMPUTING**

**DATE: APRIL 2015 TIME: 2 HOURS**

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

**QUESTION ONE (30 MARKS)**

1. Evaluate the following expression with a=100, b=20, c=10, d=5 and e=1, show the evaluation at each step

 (4 Marks)

1. Given a=55.50E-1, b=4.545E00 and c=0.4535E01, Find a(b-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 (3 Marks)
2. Differentiate between an overflow and an underflow by using appropriate examples in computer arithmetic (2 Marks)
3. Explain the following operators and give an example of each
4. Logical operators (2 Marks)
5. Relational operators (2 Marks)
6. Conditional operators (2 Marks)
7. Evaluate each of the following expressions independent of each other and give the output. The declaration and initialization statement is

int i=3, j=4, k=2

1. ++k%--j (2 Marks)
2. j+1/i-1 (2 Marks)
3. The choice of given programming language should be based on specified criteria. Identify three considerations that constitute this evaluation criterion and provide a justification of each of them (6 Marks)
4. Identify the three different types of constants used in C language. Give two examples in each type (3 Marks)
5. Express the following mathematical expression into C language expressions
6.  (1 Mark)
7.  (1 Mark)

**QUESTION TWO (20 MARKS)**

1. What is the output of the program segment? Explain by tracing the segment (3 Marks)

**int p=7;**

**float q=2;**

**float r;**

**r=p/q;**

1. Define the following terms as applied in programming
2. Assignment statement (1 Mark)
3. Character set (1 Mark)
4. Orthogonally (1 Mark)
5. Programming paradigm (1 Mark)
6. Given the expressions below, perform the hierarchy of computation and mention the type of the operator, hence determine the value of *a* given that the initial value of a=5
7. a+=(a++) + (++a) (3 Marks)
8. a=(--a)-(a--) (3 Marks)
9. During programming, errors are encountered provided a distinction between syntax errors and logical errors (2 Marks)
10. (i) What is a data type (1 Mark)

(ii) Discuss the following simple data types and identify the advantages and disadvantages

of using them

1. int (2 Marks)
2. double (2 Marks)

**QUESTION THREE (20 MARKS)**

1. Briefly describe the design process, overview and evaluation of the following programming languages
2. ADA (3 Marks)
3. COBOL (3 Marks)
4. FORTRAN (3 Marks)
5. SMALLTALK (3 Marks)
6. Given three integers, design an algorithm to compute the GCD and LCM of the three integers. Also come up with a flow chart and a simple C-program to implement the designed algorithm (8 Marks)

**QUESTION FOUR (22 MARKS)**

1. Given hypothetical machines of word length 3-bits and 5-bits, derive the expression for finding the maximum numbers that can be represented using signed and unsigned notations, in a computer memory (8 Marks)
2. Using a suitable illustrative process diagram, explain the phases of the compilation process

(6 Marks)

1. Find the values of the variables in the following program segments by tracing each out

(6 Marks)

**(i)**

**int a, b, c; (ii)**

**float x,y; int a,b;**

**a=10; float c;**

**b=15; a=25/10+6.5;**

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

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

**y= (float) b/b;**

**QUESTION FIVE (24 MARKS)**

1. 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. Classify the operators in C language based on the number of operands and give suitable examples (6 Marks)
2. With the help of an example, explain the following functions
3. getchar () (2 Marks)
4. putchar () (2 Marks)
5. Using an illustrative diagram, present an overview of errors that can be made when solving real-life problems with mathematical methods using scientific computing (6 Marks)