Eastern Mediterranean University
Department of Computer Engineering

CMPE 108 – Algorithms and Programming
Midterm Exam, 2015-2016 Fall Semester Nov 21, 2015
Duration: 90 minutes

Name, Surname: ..... Group : .....

Student No : ..... Signature :.....

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Instructions:
There are **7** questions in **7** pages including the cover page.
Calculators, mobile phones and any electronic devices are **NOT** allowed.
A table of operators for precedence and associativity is attached on Cover Page.
Passing any material including rubbers, pencils etc. to anybody else is strictly prohibited in the exam.
Asking questions to invigilators is prohibited. The instructors will visit the exam rooms regularly.

Q1 (10%)	Q2 (15%)	Q3 (15%)	Q4 (15%)	Q5 (15%)	Q6 (15%)	Q7 (15%)	Total (100%)

PRECEDENCE AND ASSOCIATIVITY TABLE

Operators	Associativity
`( ) [ ] -> .`	Left to right
`! ++ -- + - * & (type)`	Right to left (Unary)
`* / %`	Left to right
`+ -`	Left to right
`< <= > >=`	Left to right
`== !=`	Left to right
`&&`	Left to right
`||`	Left to right
`?:`	Right to left
`= += -= *= /= %=`	Right to left
`,`	Left to right

% specifiers in ANSI C:

%c char single character	**%o** int unsigned octal value
%d (**%i**) int signed integer	**%p** pointer address stored in pointer
%e (**%E**) float or double exponential format	**%s** array of char sequence of characters
%f float or double signed decimal	**%u** int unsigned decimal
%g (**%G**) float or double use **%f** or **%e** as required	**%x** (**%X**) int unsigned hex value

String Control Codes
\b backspace, **\f** formfeed, **\n** new line, **\r** carriage return, **\t** horizontal tab, **\'** single quote, **\0** null

Q.1. 10 p

Find the best choice among A, B, C, or D as the answer of each question. Write your answer in the answer box provided.

a. Which of the following properties does not belong to C? [ ]

A) It is a high-level programming language. B) It is a small programming language.
C) It is an efficient programming language. D) It has standard libraries.

b. What is the correct order of memory unit magnitudes? [ ]
TB=Terabyte, GB=Gigabyte, MB=Megabyte, and KB=Kilobyte

A) KB < GB < MB < TB B) KB < MB < TB < GB
C) KB < MB < GB < TB D) MB < KB < MB < GB

c. What the main circuit board in system unit is called? [ ]

A) CPU B) Graphic Card C) Motherboard D) Hard-drive

d. Central Processor Unit (CPU) is composed of two components: ..... and …… [ ]

A) input and output B) primary and secondary storage
C) ALU and CU D) none of the choices

e. Each of ASCII, ANSI, and Unicode standards is based on how many bits respectively? [ ]
A) 8, 7, and 16 B) 7, 8, and 16 C) 7, 16, and 8 D) 16, 7, and 8

f. Which of the following components is connected to the motherboard? [ ]

A) Processor B) Memory Chips C) Expansion boards D) All of the choices

g. Choose which set of operations are the task of Control Unit (CU) [ ]
1. Reads and interprets instructions
2. Performs computations
3. Performs logical operations (comparisons)
4. Directs the operation of internal processor components
5. Controls the flow of programs and data in and out of RAM
6. Accumulator – register where answers are stored

A) 1,2, and 3 B) 4, 5, and 6 C) 1, 3, and 6 D) 1, 4, and 5

h. Which of the following is NOT a kind of memory? [ ]

A) RAM B) Register C) Cache D) BUS

i. Which of the choices is one of the specifications of ROM? [ ]

A) It is volatile B) Contains instructions that the user cannot change
C) It is inside CPU D) Performs computations

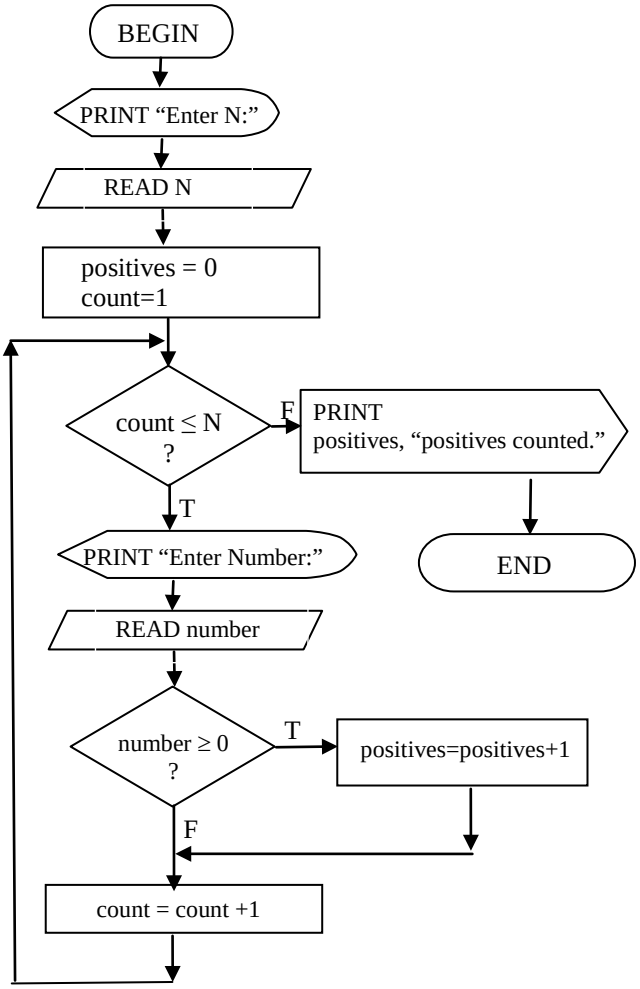
j. Which of the following is NOT a programming language? [ ]

A) UNIX B) Java C) Perl D) C#

k. Which of the following operators has the highest precedence. [ ]

A) ***** B) **( )** C) **++** D) **=**

Q2. 15p Design an algorithm for the given flowchart.



ALGORITHM

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…….

b) Trace the flowchart for N=3 and numbers -1, 5, 4 .

N	positives	count	number	number>=0	count <= N

Q.3. 15p.

a. (6 p) Write down an equivalent C expressions to each of the following expressions. Do not use unnecessary parentheses. Write the answers into the answer boxes.

Mathematical Expression	C Expression
$\frac{(a+b)}{(c \times d) - (e/f)} g^3$	
$\frac{1}{2}x^2 + \frac{xy}{x+\frac{1}{x}}$	
$\frac{\frac{2}{3}(x^2)}{\frac{1}{4}+x}$	

b. (6 p) Write down a mathematical expressions to each of the following expressions.

C Expression	Mathematical Expression
`sqrt((b*b) – (4*a*c))`	
`2*n*n*n – 4*n*n + 3*n + 1`	
`(a*a – b*b)/(a - b) + 1/a + 1/b`	

c (3 p) State which of the following C identifier names are valid or invalid. Give reason if invalid.

Identifier Name	Valid or Invalid	Reason(s) if Invalid
`StdGrades`		
`float`		
`numOfRows`		
`_10`		
`10_student`		
`Return`		
`my_age`		
`_X`		
`total Value`		
`familyname`		
`x_y_z`		
`x.y`		

Q.4. 15 p.

Evaluate the following expressions using the precedence table for the declared values of the variables, and fill its final type (integer or float) and numerical value into answering box.

a. (3p)

```
int d=3, t= 25;
float f=3.2;
f * 3  +  t / d % 5
```
TYPE : VALUE:

b. (3p)

```
int b = 7;
float e = 2.60;
e = b + e / 2
```
TYPE : VALUE:

c. (3p)

```
int r =7;
2.0f * r / 2
```
TYPE : VALUE:

d. (3p)

```
int a=3;
float b=2.5;
2 + b - ++a
```
TYPE : VALUE:

e. (3p)

```
int  t = -3;
t += 5 / 6 + 4 * 5 %  6 - 1
```
TYPE : VALUE:

Q.5. (15 p)

For the following display outputs fill in the blanks of the printf statements to get the output exacly as given below. Note that in codes and output "_" represents the space character.

a. `printf("A=%.....cm", 25)` to get the output: `A=25_ _ cm` . . .

b. `printf("p=%.....USD", -3.456)` to get the output: `p=-3.46_USD` . . .

c. `printf("L=%.....m", 78.901)` to get the output: `L=_ _ 78.90m` . . .

d. `printf("%..... km", 123.45678)` to get the output: `_ 1.2e+002km` . . .

e. `printf("%.....counts", 5)` to get the output: `005_ _ counts` . . .

f. `printf("%.....m", 75)` to get the output: `75m` . . .

g. Fill in the blanks of the following `scanf` statement to read two integers and one floating point numbers (`i`, `x`, and `y`) correctly.

```
float i; int x, y;

scanf(.....);
```

Q6) 15p.

Fill the missing parts of the following C program that performs the following steps.

a) read the heights of two students in centimeters (cm)
b) sum the heigths of two in centimeters (cm)
c) Set up two equations to find the total heigth of these student in meters (m) and centimeters (cm).
d) (For example, the total is 360 cm long is in fact 3 meter 60 cm long).

Output of the C program should be

```
Enter the height of first student=XXX
Enter the height of second student=XXX
Total height in centimeters=XXX
******************************
Total lenght XXX m XXX cm
```

There are 9 blanks in the program. Complete each of the blanks.

```
#include <stdio.h>

#include <stdlib.h>

int main(void)

{

    int height1, height2;

    int Total;

    int height_cm;

    int height_meters;

    printf("Enter the height of first student=");

       scanf("%d",_____________________);       /* Enter the height of first student in cm*/

    printf("Enter the height of second student=");

    scanf("%d",_____________________);        /* Enter the height of second student in cm*/

    Total= _____________________________; /* Find total height in centimeters */

    printf("Total height in centimeters=_____________", _____________ );  /*Print total*/

    height_meters=_____________________________;   /* Find height in meters */

    height_cm= _____________________________; /* Find height in centimeters (residual)*/

    printf("\n******************************\n"),

    printf("Total length %d m %d cm\n",_____________________, _____________________);

    system("pause");

    return (0);

 }
```

Q.7. 15p

The following C program contains some programming mistakes in seven statements. Find the lines with programming mistake(s) and write down the corrected statements in the boxes given below:

```
 1. /* Computes the dimensional weight of a 12" x 10" x 8" box //
 2. #include <stdio.h> ;
 3. int main(void)
 4. (
 5.  int height, length, width, volume, weight;
 6.  Height = 8;
 7.  length = 12;
 8.  width = 10;
 9.  volume = height * length * width;
10.  weight = (volume + 165) / 166;
11.  printf("Dimensions: %d x %d x \n", length, width, height);
12.  printf("Volume (cubic inches): %d\n", &volume);
13.  printf("Dimensional weight (pounds): %d\n",  weight);
14.  return 0
15. }
```

Line number	Corrected statement

Solutions

Q1 **A C C C B D D D B A B**

Q2 algorithm

```
OUTPUT "Enter N:"
   INPUT N
   positives = 0
   count=1
   WHILE count <= N
      OUTPUT "Enter Number"
      INPUT  number
      IF number >= 0
         positives=positives+1
      END_IF
      count =count+1
   END_WHILE
   OUTPUT positives
```

tracing

```
   N positives count number number>=0 count<=0
   3     0       1                        T
                        -1      F
                 2                        T
                          5      T
         1       3                        T
                          4      T
         2                                F
     output:2
```

Q3 a) `(a+b)/(c*d-e/f)*g*g*g`

`x*x/2.+x*y/(x+1/x)` . . . . . (note that 1/2*x*x+x*y/(x+1/x) deletes x^2)

`2*x*x/3/(1/4.+x)` . . . . . (note that 2/3*x*x/3/(1/4+x) deletes both x^2 and 1/4=0.25)

b) $\sqrt{b^2 - 4ac}$

$2n^3-4n^2+3n+1$

$$\frac{a^2 - b^2}{a - b} + \frac{1}{a} + \frac{1}{b}$$

c) valid, inv: keyword, valid, valid, inv: starts with number, valid, valid, valid, inv:space not allowed, valid, valid, inv:dot not allowed.

Q4. float 12.6, float 8.3, float 7.0, float 0.5, int -2.

Q5. a) `-4d` b) `-6.2f` c) `7.2f` d) `9.1e` e) `-5.3d` f) `d`
g) `"%f%d%d",&i,&x,&y`

Q6 `&height1` \\ `&height2` \\ `height1+height2` \\ `%d` \\ `Total` \\ `Total/100` \\ `Total%100` \\ `height_meters` \\ `height_cm` .

Q7

```
 1  ….. box */
 2  extra semicolon at the end.
 4  {
 6  height = 8;
11  ….. %d x %d x %d \n", …..
12  ….. %d\n", volume ) ;
14   return 0;
```