

Section Points

A	/ 15
В	/ 30
С	/ 55
Total	/100

EASTERN MEDITERRANEAN UNIVERSITY

Department of Computer Engineering

CMSE 318 -PRINCIPLES OF PROGRAMMING LANGUAGES

Final Examination

2023-2024 Spring Semester

08 June 2024

Instructors:

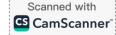
Dr. Felix Babalola (Gr 1), Dr. John Olaifa (Gr 2, 3)

Name:	Surname:	
	Max_len = size -/1;	
	Student Number:	

Duration: 90 Minutes

Instructions

- 1. Answer all questions in Sections A and B, and any 5 questions in Section C.
- 2. Do not attempt to communicate with others during the period of the examination.
- 3. Smart devices MUST NOT be accessible to you during the examination.



SECTION A (Multiple choice) 15 Points

1. Consider the declaration of int	k = 0; and $i = 4$; Describing the type
of variable k is known as	declaration?

a. Implicit

b. Explicit

c. Definitive

d. Associated

2. If
$$h = f \circ g$$
, where $f(x) = x - 1$, and $g(x) = 2 * x + 4$. Find $h(4)$.

a. 11

b. 12

c. 15

- d. 16
- **3.** A functional form that takes a single function as a parameter and yields a list of values obtained by applying the given function to each element of a list of parameters is called?
- a. Function Composition
- b. Functional Transparency

c. Apply to all

- d. Element-wise Evaluation
- **4.** The C++ constructor defined below is a _____ constructor.

a. Default constructor

- b. Overloaded constructor
- c. Parameterized constructor
- d. Reference constructor
- 5. What is the primary purpose of the Mark-Sweep algorithm?
- a. To generalize the concept of operands and operators
- b. To ensure operands of an operator are of compatible types
- c. To perform stack-sweeping operations
- d. To trace all pointers into the heap and free up disconnected pointers

6. Consider the following Java code;

int all=0, x=5;
 boolean d = true;
 if (x-->5)
 if (d)
 all+=4;
 else
 all=-1;
 System.out.println("="+all);

What is the output of println?

- **7.** What is a key difference between accessing elements in arrays and records?
- a. Arrays use parentheses for access while records use curly braces
- b. Arrays have static subscripts while records have dynamic field names
- c. Arrays have dynamic subscripts while records have static field names
- d. Arrays use brackets for access while records use subscripts
- **8.** "If the order of evaluation is not important, the program should not specify one". This explains the concept of;
- a. Encapsulation

b. Guards

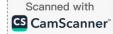
c. Decapsulation

- d. Higher order functions
- 9. Scalar variables are categorized as the following EXCEPT?
- a. Stack abstract

b. Stack dynamic

c. Explicit heap dynamic

d. Implicit heap dynamic



10. Which of the following para	ameter passing model is not Inout
mode?	
a. Pass by Reference	b. Pass by Name
c. Pass by Value-Result	d. Pass by Value
SECTION B (Fill t	ne blanks) 30 Points
1. Considering the number of operator	perands, $A?B:C$ is an example of C .
2. The output of the lambda expres	sion (λ(x) x * x * x)(3) is
3. The is the e	ncapsulation device in C++ abstract
type implementation?	
4. are able	to obtain access to private members
in Abstract Data Types.	
5. Consider the following Python s	ubprogram, and its activation/call;
<pre>def Balance(expense, income):</pre>	
Worth=income-expense	
return Worth	
A=100	
B=49	
C=Balance(income=A, expense=B)	A DEBURGARIA B
is	the parameter correspondence
approach used in the main progra	m. Apartales ensembles temporales a
6. Variables can be characterized	as a sextuple of attributes among
which are	and .

7. Counter controlled loops have <u>initial</u> , <u>terminal</u> , and							
values in the control statement.							
. A is a dummy variable listed in the subprogram							
header and used in the subprogram.							
9 is the association of attributes with program entities.							
10. What is the association of strongly typed languages and type errors in programming codes?							
11 of a variable is the time during which it is bound to a particular memory cell.							
12. The result of an expression may be determined without evaluating all of the operands and/or operators due to evaluation.							
13. type of array has rows with varying number of elements.							
14 is the use of an operator for more than one purpose.							
15. What type of subprogram is XY if it could be called with ANY of the following activation:							
XY(5, 6);							
XY(5);							
XY('E', 'A');							

Section C (55 Points)

- 1. Using short, but very clear explanations, answer the following;
- a. Differentiate between Strict and Non-Strict Languages.
- b. What are coroutines, how are they different from functions?
- c. What is functional side effect? How is it avoided in purely functional programming languages?
- d. What are generic subprograms? Complete the generic subprogram definition by filling in the blank spaces:

template <class< th=""><th>s</th><th colspan="3"><u> </u></th><th></th><th></th></class<>	s	<u> </u>				
	_ max(_		first, _		second)	{
return	first >	second	? first	:	second;	
}						

2. Consider the following piece of code,

```
int main(){
int x = 5

void A() {
    int y = 10
    B()}

void B() {
    C()}

void C() {
    print(y)}

A()}
```

If the environment pointer for main was at 0, A at 1000, B at 2000, C at 3000 in memory, and the local offset for x and y is 8bytes each. Compute the **dynamic chain length**, and **effective address** required to obtain y in C. Assume dynamic scoping.

3. What is the output of the expression fun [5, 4, 3, 2, 1] [3, 5] given the Haskell program:

```
fun [ ] a = [ ]

fun b [ ] = [1, 0]

fun (x : y) (q : w) | x > q = (x-q) : fun(y w)

| otherwise (x+q) : fun(w y)
```

4. Zen is an imperative language similar to C. Assume that it is **statically** scoped and parameters are **passed by value**. Show the **content of the system stack** at the point of **print** statement, assuming that the first function called is the main function. Be sure to show and label **all** relevant pointers.

```
void main()
{
int x, y = 5, z = 1;
void g(int x) {
     int y = 10;
     void f(int x) {
          int z = 2;
          y++;
          h(z);
          print("f: " x+y+z);
     y = --z ? ++x : z++;
     f(y);
     print("g: " x+y+z);
void h(int y) {
     y += 10;
     print("h: " x+y+z); ;
     x = y + 2;
     g(x);
     print("main: " x+y+z);
}
```

5. Ken is a **statically** scoped language similar to C. Find the output of the following program according to the parameter passing mechanism.

```
void main(){
    int x = 6, y = 5, z = 0;
    void g(int x){
        y = x > z ? ++x : ++z;
        h(x);
        print("g: " x+y+z);
    }
    void h(int y){
        y += 10;
        print("h: " x+y+z);
    }
    y = x > z ? ++x : ++z;
        g(x);
        print("main: " x+y+z);
}
```

a. Pass by value mechanism:

b. Pass by reference mechanism:

c. Pass by value-result mechanism:

6. The following code is written in Tau, a language similar to C.

```
void main(){
     int x, y = 5, z = 1;
     void g(int x){
          int y = 10;
          void f(int x){
               int z = 2;
               y++;
               h(z);
               print("f: " x+y+z);
          }
          y = --z ? ++x : z++;
          f(y);
          print("g: " x+y+z);
     }
     void h(int y){
          y += 10;
          print("h: " x+y+z); ;
     }
          x = y + 2;
          g(x);
          print("main: " x+y+z);
}
```

a. Find the output, if the program is statically scoped.

b. Find the output, if the program is dynamically scoped.