

Technical Test DEV - D

Date: 01/10/2002 City/State: São Paulo/ Sao paulo

Course: Sistemas de Informação Educational Institution: UNICID Course Duration (in years): 4 Current Semester: 5 Graduation Year (expected): 2026 Availability to work: 20h x 30h 40h Estimated Start Date: Imediato

**Instructions:**

This test consists of 8 multiple choice questions, 1 algorithm implementation and 1 non- technical question. The algorithm is worth 60% of the total score. The non-technical question must be answered in Portuguese.

You may use any blank space on this test as a draft. Use the table below to record your answers.

Good luck!

**Answer Sheet**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A |  |  |  | X |  |  |  |  |
| B |  |  |  |  |  |  |  |  |
| C | X | X | X |  |  | X | X | X |
| D |  |  |  |  | X |  |  |  |

## Question 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Given: |  | | | |
| 1. | public | class A { |  |  |
| 2. | public | void print(){ System.out.println("x"); | } | 3. |
|  | } |  |  |  |
| 4. | public | class B extends A { |  |  |
| 5. | public | void print(){ System.out.println("y"); | } | 6. |
|  | } |  |  |  |
| 7. | public | class Main{ |  |  |
| 1. public static void main(String[] args) { 2. B test = new A(); 3. test.print();   11. }  12. } | | | | |

What’s the output?

1. x
2. y
3. Runtime or Compilation error on line 9
4. Runtime or Compilation error on line 10

## Question 2

Given:

Consider the following statements:

1. //\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
2. // file A.java
3. //\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
4. package a;
5. public class A {
6. private int x;
7. protected int y;
8. public int m1() {return x;}

9. }

1. //\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
2. // file B.java
3. //\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
4. package b;
5. import a.A;
6. public class B extends A {
7. private int z;
8. public void m2(A a){
   1. Line 18 is not valid because y is protected on A
   2. Line 19 is not valid because x is private
   3. Line 20 is valid because m1() is public
      1. Only I and II are correct
      2. Only I and III are correct
      3. Only II and III are correct
      4. I, II and III are correct

|  |  |  |  |
| --- | --- | --- | --- |
| 18. | z | = | y; |
| 19. | z | = | a.x; |
| 20. | z | = | a.m1(); |
| 21. | } |  |  |
| 22. } |  |  |  |

## Question 3

What are the major elements in an object model?

1. Abstraction, encapsulation and persistence
2. Hierarchy, persistence and typing
3. Abstraction, encapsulation and hierarchy
4. Hierarchy, concurrency and typing

## Question 4

Suppose the keys {1,2,3,4,6,9} are inserted into a hash table with collisions resolved by chaining. Let the table have 3 slots, and the hash function be h(k) = k % 3, that is, h(k) returns the remainder of the Euclidean division of k by 3. How will the keys be organized into this hash table?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A. 1->4 | B. | 3->6->9 | C. | 3->4 | D. | 1 |
| 2->6 |  | 1->4 |  | 1->6 |  | 2->4 |
| 3->9 |  | 2 |  | 2->9 |  | 3->6->9 |

## Question 5

Consider the following statements:

* 1. A Binary Tree is a tree data structure in which each node has at most two child nodes, usually distinguished as "left" and "right", and a tree with *n* nodes has exactly *n*−1 branches.
  2. A Hash Map is a data structure in which, if there’s no collision among the keys, you can always find an element in O(1) time, even in the worst case.
  3. In a doubly linked list data structure, each item is linked to both the previous and the next items in the list, allowing easy access of list items backwards as well as forwards.
     1. Only II and III are correct
     2. Only II is correct
     3. Only III is correct
     4. I, II and III are correct

## Question 6

In the following code, assume that Queue is not thread-safe, there is more than one Producer thread and more than one Consumer thread running and this program is crashing on runtime. In order to fix the code below how should you fill in lines (1), (2), (3) and (4)?

|  |  |
| --- | --- |
| **Global variables** | |
| Queue q;  **(1)** | |
| **Producer thread** | **Consumer thread** |
| runProducer(){ while(true){  item = new item();  **(2)**  if (q is not full){ q.enqueue(item); **(3)**  }  **(4)**  }  } | runConsumer(){ while(true){  **(2)**  if (q is not empty){ item = q.dequeue(); **(3)**  }  **(4)**  }  } |

1. (1)

(2)

* 1. if(Consumer) sleep(1); else sleep(2);

(4)

1. (1) mutex m;

(2)

* 1. m.lock();
  2. m.unlock();

1. (1) semaphore guard;

(2) wait(guard);

(3)

(4) signal(guard);

1. Alternatives A, B and C are all correct.

## Question 7

Considering the following tables and data information, what would be the correct result of the SQL command below?

|  |  |  |  |
| --- | --- | --- | --- |
| **Salesperson** | | | |
| **ID** | **Name** | **Age** | **Salary** |
| 1 | Abe | 61 | 140,000 |
| 2 | Bob | 34 | 44,000 |
| 5 | Chris | 34 | 40,000 |
| 7 | Dan | 41 | 52,000 |
| 8 | Ken | 57 | 115,000 |
| 11 | Joe | 38 | 38,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Customer | | | |
| ID | Name | City | Industry\_Type |
| 4 | Samsonic | Pleasant | G |
| 6 | Panasung | Oaktown | N |
| 7 | Samony | Jackson | N |
| 9 | Ornange | Hayward | G |
| 8 | Hepoul | Cupertino | I |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Orders** | | | | |
| **Number** | **Order\_Date** | **cust\_id** | **salesperson\_id** | **Amount** |
| 10 | 8/2/2010 | 4 | 2 | 540 |
| 20 | 5/6/2012 | 9 | 7 | 150 |
| 30 | 3/12/2012 | 8 | 5 | 1,500 |
| 40 | 1/30/2013 | 4 | 8 | 1,800 |
| 50 | 7/14/2009 | 9 | 1 | 460 |
| 60 | 1/29/2012 | 7 | 2 | 2,400 |
| 70 | 2/3/2012 | 6 | 7 | 600 |
| 80 | 4/1/2013 | 8 | 2 | 2,300 |
| 90 | 3/2/2012 | 6 | 7 | 720 |

SELECT Salesperson.Name from Salesperson WHERE Salesperson.ID NOT IN(

SELECT Orders.salesperson\_id FROM Orders

INNER JOIN Customer ON Orders.cust\_id = Customer.ID WHERE Customer.Name = 'Samsonic')

AND Salesperson.ID IN

(SELECT DISTINCT Orders.salesperson\_id FROM Orders);

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A. Abe | B. | Abe | C. Abe | D. Bob |
| Chris |  | Bob | Chris | Ken |
| Dan |  | Chris Dan | Dan  Joe |  |

## Question 8

Given this output on a Linux terminal:

**$ cat** unix\_like\_systems.txt MINIX operating system

UNIX operating system Linux operating system

MINIX and UNIX operating system MINIX and Linux operating system UNIX and Linux operating system

What will be the correct result of the command below?

1. MINIX and UNIX operating system UNIX and Linux operating system UNIX operating system
2. operating system UNIX

and MINIX operating system UNIX and Linux operating system UNIX

1. and MINIX operating system UNIX and Linux operating system UNIX operating system UNIX
2. UNIX operating system

MINIX and UNIX operating system UNIX and Linux operating system

$ cat unix\_like\_systems.txt | grep UNIX | sort

# Infinite Coins

Given an infinite number of quarters (25 cents), dimes (10 cents), nickels (5 cents) and pennies (1 cent), write a method **makeChange()** to calculate and return a Set containing the ways of representing n cents using those coins. Each element of the returned Set should represent the number of coins to compose the entry value, an array like this: [quarters, dimes, nickels, pennies].

The method **makeChange()** can use a Set data structure to store each representation of n cents, and then, return it. A **Set** is a collection that contains no duplicate elements and the order of elements is irrelevant. Consider the following interface defined for Set:

*Table: Set interface*

**Input example:**

n=12

**Output for the given example:**

[[0,0,0,12], [0,0,1,7], [0,0,2,2], [0,1,0,2]]**\***

|  |  |
| --- | --- |
| **Method signature** | **Method description** |
| boolean add(Element e) | Adds the specified element to this set if it is not already present (optional operation). |
| boolean addAll(Set s) | Adds all elements from s that are not already present in this set. |
| boolean contains(Element e) | Returns true if this set contains the specified element. |
| boolean equals(Set s) | Compares the specified set s with this set for equality. |
| Iterator<Element> iterator() | Returns an iterator over the elements in this set. |
| boolean remove(Element e) | Removes the specified element from this set if it is present (optional operation). |
| int size() | Returns the number of elements in this set (its cardinality). |
| Element[] toArray() | Returns an array containing all of the elements in this set. |

**\*** this is the content of the **Set** which should be returned by the function.

Your proposed solution can be written in **pseudo-code** or any well-known language (C, C++, Java, etc) and you are free to implement any auxiliary functions. Besides, write down a comment to the implemented function, explaining how your function will work like the one below.

/\*\*

* The function below will ...
* - Obtain the input
* - Iterate over the elements
* …
* - Print the output and return ...

\*/

# Algorithm Solution

Algoritmo "Calcular"

//

//

// Algoritmo para calcular as moedas

Var

valor, convercao: inteiro

moedas: vetor[1..4] de inteiro // {quarters, dimes, nickels, pennies}

Inicio

// Inicializa o vetor de moedas

moedas[1] <- 0 // Quarters

moedas[2] <- 0 // Dimes

moedas[3] <- 0 // Nickels

moedas[4] <- 0 // Pennies

// Entrada de dados

Escreva("Digite o valor: ")

Leia(valor)

// Calcula o troco

convercao <- valor

// Verifica se o troco é negativo

Se (convercao < 0) Então

Escreva("Valor de pagamento insuficiente.")

Senao

// Calcula o número(25)

moedas[1] <- convercao / 25

convercao <- convercao % 25 // Atualiza o troco restante

// Calcula o número(10)

moedas[2] <- convercao / 10

convercao <- convercao % 10

// Calcula o número (5)

moedas[3] <- convercao / 5

convercao <- convercao % 5

// Calcula o número (1)

moedas[4] <- convercao

// Imprime o resultado

Escreva("Troco em moedas: {", moedas[1], ", ", moedas[2], ", ", moedas[3], ", ", moedas[4], "}")

FimSe

Fimalgoritmo

Qual a disciplina que você mais gostou de cursar na faculdade e por quê? (Responder em português)

A Disciplina que eu mais gostei foi a de banco dados, pois foi uma matéria que eu sempre gostei, desde a época que eu fazia Técnico em Informática eu me dava bem com essa matéria