Systems Programming
Second miterm exam - Groups 95 and 196
Part 1 - Theory (3 points) - 20 minutes

uc3m

Each correct answer adds 0.3 points and each incorrect answer substracts 0.1 points

Q1	Which of the following statements is FALSE:
1)	In a queue implemented with a linked list, the elements are inserted and extracted by the same end of the queue.
2)	A queue is a linear data structure.
3)	In a queue implemented with a linked list it is more convenient to extract by the beginning of the queue.
4)	A queue implemented via an array has a maximum capacity that is set at the time the queue is created.

Q2	We have the next set of statements
	
	Stack stack = new Stack();
	stack.push("A");
	stack.push("Y");
	stack.push("Z");
	stack.pop();
	stack.push("B");
	stack.pop();
	stack.pop();
	stack.push("H");
	
	Going from the top of the stack to the bottom, what does the stack contain after executing the above mentioned set of statments?

1)	H,A
2)	A,H
3)	H,A,Z
4)	Y,Z, B

Q3	Which of the following is an important limitation of linked lists?
1)	Additional memory is needed to store the objects of class Node with their attributes when using a linked list.
2)	Concatenating two linked lists has a computational cost that is independent of the size of the lists.
3)	There is no need for large amounts of contiguous memory to store information in a linked list.
4)	Inserting a new element in a linked list has a computational cost that is independent of the size of the list.

Q4	Given an empty queue implemented through a linked list, and in which these elements are inserted one by one in the order indicated 3,4,8,2,1,7,9, what would the call to the next method print?
	
	`public void method(){`
	`    if(top != null){`
	`        Node aux = top;`
	`        while(aux.getNext()!=null){`
	`            aux = aux.getNext();`
	`        }`
	`        System.out.println(aux.getInfo());`
	`    }`
	`}`

1)	9
2)	3
3)	7
4)	null

Q5	Given the binary tree represented by the array = {a, b, c, , , d, e}. Indicate the height of the tree. NOTE: blank spaces between commas indicate empty nodes.
1)	2
2)	1
3)	3
4)	5

Q6	Which of the following statements is FALSE?
1)	For a heap to be considered complete it must have all levels filled to their capacity.
2)	The number of comparisons to search for an element in a binary search tree depends directly on the depth of the node containing the desired information.
3)	All sub-trees of a binary search tree are also binary search trees.
4)	All the sub-trees of a min-heap are also min-heaps.

Q7	Given the heap represented by the array {4, 8, 5, 10, 9}, which would be the resulting array that would represent the resulting heap after executing the following statements, and where the method extract extracts the root of the heap?
	
	`insert(2);`
	`extract();`
	`insert(6);`
	`extract();`

1)	{5, 8, 6, 10, 9}
2)	{8, 6, 5, 9, 10}
3)	{5, 6, 8, 9, 10}

4)	{8, 5, 6, 4, 9}

Q8	Given a binary search tree for football teams, initially empty, what is the result of calling teams.printPreOrder() after running the following statements (first parameter is the info, name of the team; second parameter is the key, year of foundation).
	
	teams.insert("Real Madrid", 1902);
	teams.insert("Barcelona",1899);
	teams.insert("Atletico de Madrid",1903);
	teams.insert("Sevilla",1905);
	teams.insert("Espanyol", 1900);
	teams.insert("Betis", 1907);
	teams.insert("Real Sociedad", 1909);
	teams.insert("Valencia", 1919);

1)	Real Madrid, Barcelona, Espanyol, Atletico de Madrid, Sevilla, Betis, Real Sociedad, Valencia
2)	Barcelona, Espanyol, Real Madrid, Atlético de Madrid, Sevilla, Betis, Real Sociedad, Valencia
3)	Espanyol, Barcelona, Valencia, Real Sociedad, Betis, Sevilla, Atlético de Madrid, Real Madrid
4)	Real Madrid, Espanyol, Atletico de Madrid, Barcelona, Sevilla, Valencia, Betis, Real Sociedad

Q9	How many iterations are need to find the value 12 with Linear Search and with Binary Search? {1, 4, 7, 8, 11, 12, 17}
1)	6 with Linear Search and 2 with Binary Search
2)	7 with Linear Search and 3 with Binary Search
3)	We cannot use Binary Search in this case.
4)	3 with Linear Search and 3 with binary Search

Q10	How many swaps does the Bubble Sort algorithm needs to sort this array of integers from the lowest to the highest? {41, 20, 36, 59, 17}
1)	6
2)	5
3)	7
4)	4

PREGUNTA	SOLUCIÓN
Q1	1

Q2	1
Q3	1
Q4	1
Q5	1
Q6	1
Q7	1
Q8	1
Q9	1
Q10	1