Introduction to Computer Science-102
Quiz_3

1. Explain the difference between FTP and TELNET. When would you use FTP and when would you use TELNET? (7%)
   FTP is used to transfer files over a network. TELNET is used to establish a login session on a remote machine. After establishing a session, we can also use TELNET commands to copy files.

2. What is the function of virtual memory? And what are the potential benefits of it? (7%)

   A technique that allows the execution of a process that may not be completely in memory.

   Programs can be much larger than the amount of physical memory. Users can concentrate on their problem programming.

   The level of multiprogramming increases because processes occupy less physical memory.

   Each user program may run faster because less I/O is needed for loading or swapping user programs.

3. Three processes (A, B, and C) are running concurrently. Process A has acquired File1, but needs File 2. Process B has acquired File3, but needs File 1. Process C has acquired File2, but needs File3. Draw a diagram for these processes. Is this a deadlock situation? (10%)
   This is a deadlock situation (see following figure) because all four conditions of deadlock (mutual exclusion, resource holding, no preemption, and circular waiting) are all present.

4. Using the insertion sort algorithm manually sort the following list and show your work in each pass using a table: (10%)

   <center>7   23   31   40   56   78   9   2</center>

Pass	List							
	14	7	23	31	40	56	78	9	2
1	7	14	23	31	40	56	78	9	2
2	7	14	23	31	40	56	78	9	2
3	7	14	23	31	40	56	78	9	2
4	7	14	23	31	40	56	78	9	2
5	7	14	23	31	40	56	78	9	2
6	7	14	23	31	40	56	78	9	2
7	7	9	14	23	31	40	56	78	2
8	2	7	9	14	23	31	40	56	78

請忽略"14"即為正解!!

5. A list contains the following elements. Using the binary search algorithm, trace the steps followed to find 20. At each step, show the value of ***first***, ***last***, and ***mid***. (10%)

17	26	44	56	88	97
1	*2*	*3*	*4*	*5*	*6*

first	last	mid
1	6	3
1	2	1
2	2	2
2	1	1

17	26	44	56	88	97	target < 44
17	26					target > 17
	26					target < 26

first > last → Target is not in the list

6. Using the bubble sort algorithm manually sort the following list and show your work in each pass using a table: (10%)

<div align="center">24 77 63 8 40 15</div>

7. Write an algorithm in pseudocode for the selection sort using a subalgorithm to find the smallest integer in the unsorted sublist. (16%)

Algorithm: SelectionSort(list, n)
Purpose: to sort a list using selection sort method
Pre: Given: A list of numbers
Post: None
Return:
{
    wall ← 1   // Set wall at the left of first element
    while (wall < n)
    {
        smallest ← FindSmallest (list, wall, n)   // Call the FindSmallest
        Temp ← A_{wall} // The next three lines perform swapping
        A_{wall} ← $A_{smallest}$
        $A_{smallest}$ ← Temp
        wall ← wall + 1   // Move wall one element to the right
    }
    return SortedList
}

Algorithm: FindSmallest(list, wall, n)
Purpose: To find the smallest number in an unsorted list
Pre: Given: A list of numbers
Post: None
Return: The location of the smallest element in the unsorted list
{
    smallest ← wall   // Assume the first element is the smallest one
    cur ← wall   // The current item is the one left to the wall
    while (cur < n)
    {
        if (A_{cur} < $A_{smallest}$)   smallest ← cur
        cur ← cur + 1   //Move the current element
    }
    return smallest
}

8. Write a recursive algorithm in C to find the greatest common divisor (GCD) of two integers using the definition in following function. In this definition, the expression "x mod y" means dividing x by y and using the remainder as the result of the operation. (10%)

9. Write a recursive program in C language to find the number can be divided by three from 1 to 100 and the sum of them (10%)

10. Write a program in C language to find the number of the integers from 1 to 100 are relatively prime with 2 and 3(10%)