bijan.ghahremani2@gmail.com

Programming Practices

1-A common problem for compilers and text editors is to determine if the parentheses (or other brackets) in a string are balanced and properly nested. For example, the string “((())())()” contains properly nested pairs of parentheses, but the string “)()(” does not; and the string “())” does not contain properly matching parentheses. (a) Give an algorithm that returns true if a string contains properly nested and balanced parentheses, and false if otherwise. Hint: At no time while scanning a legal string from left to right will you have encountered more right parentheses than left parentheses. (b) Give an algorithm that returns the position in the string of the first offending parenthesis if the string is not properly nested and balanced. That is, if an excess right parenthesis is found, return its position; if there are too many left parentheses, return the position of the first excess left parenthesis. Return 􀀀1 if the string is properly balanced and nested.

دو نفره

2- An investor places $30,000 into a stock fund. 10 years later the account hasa value of $69,000. Using logarithms and anti-logarithms, present a formulafor calculating the average annual rate of increase. Then use your formula todetermine the average annual growth rate for this fund.

یک نفره

3- Rewrite the **for** loop for the random permutation generator of Section 2.2 (SHAFFER’s book)

as a recursive function.

یک نفره

4- Write a recursive function to solve a generalization of the Towers of Hanoiproblem where each ring may begin on any pole so long as no ring sits ontop of a smaller ring.

یک نفره

5- Consider the following function:

**void foo (double val) {**

**if (val != 0.0)**

**foo(val/2.0);**

**}**

This function makes progress towards the base case on every recursive call.In theory (that is, if **double** variables acted like true real numbers), wouldthis function ever terminate for input **val** a nonzero number? In practice (anactual computer implementation), will it terminate?

یک نفره

6- Write a function to print all of the permutations for the elements of an arraycontaining n distinct integer values.

یک یا دونفره

7- Write a recursive algorithm to print all of the subsets for the set of the first npositive integers.

یک نفره

8- The Largest Common Factor (LCF) for two positive integers n and m isthe largest integer that divides both n and m evenly. LCF(n, m) is at leastone, and at most m, assuming that n \_ m. Over two thousand years ago,Euclid provided an efficient algorithm based on the observation that, whenn mod m 6= 0, LCF(n, m) = GCD(m, n mod m). Use this fact to write twoalgorithms to find LCF for two positive integers. The first version shouldcompute the value iteratively. The second version should compute the valueusing recursion.

یک یا دو نفره

9- Write recursive funvtion(s) to draw Hilbert cutve of order n(natural number.)



دونفره

10- Write recursive funvtion(s) to draw *Sierpinski curve* of order n(natural number.)



دو نفره

11- Suppose you buy a budget-priced pocket PC and discover that the chip insidecan’t do multiplication, only addition. You program your way out of thisquandary by writing a recursive method, mult(), that performs multiplicationof x and y by adding x to itself y times. Its arguments are x and y and its returnvalue is the product of x and y. Write such a method and a main() program tocall it.

یک نفره

12- Implement the recursive approach to raising a number to a power, as describedin the “Raising a Number to a Power” section near the end of this chapter.Write the recursive power() function and a main() routine to test it.

یک نفره

13- Implement a recursive approach to showing all the teams that can be createdfrom a group (n things taken k at a time). Write the recursive showTeams()method and a main() method to prompt the user for the group size and the

team size to provide arguments for showTeam(), which then displays all thepossible combinations.

**یک یا دو نفره**

**14- Triangular Numbers**

It’s said that the Pythagorians, a band of mathematicians in ancient Greece who worked under Pythagoras (of Pythagorian theorem fame), felt a mystical connection with the series of numbers 1, 3, 6, 10, 15, 21, … (where the … means the series continues indefinitely). Can you find the next member of this series? The nth term in the series is obtained by adding n to the previous term. Thus, the second term is found by adding 2 to the first term (which is 1), giving 3. The third term is 3 added to the second term (which is 3) giving 6, and so on. The numbers in this series are called *triangular numbers* because they can be visualized as a triangular arrangement of objects, shown as little squares in Figure 6.1.



یک نفره