Sindh Madressatul Islam University (SMIU)

Program: BSCS (Even)

Subject: Design and Analysis of Algorithms

Instructor: Mustafa Ali Bamboat

Assignment – 1

Due Date: 05-Oct-2023 (3rd Week)

Q1. Write pseudocode of the following:

i. Factorial using loop
ii. Factorial using recursion
iii. Pythagorean Theorem $\boldsymbol{c = \sqrt{a^2 + b^2}}$
iv. Fibonacci sequence

[2 marks]

Q2. Calculate the worst-case in terms of Big O (running time and memory access) on the pseudocodes given in question 1.

[2 marks]

Q3.

a) Explain the given pseudocode, run manually if you have provided a set of P where $P = \{(4,11), (9,10), (7,7), (11,5), (2,5), (4,4), (13,3), (5,1), (7,13), (12,2), (14,10), (15,7)\}$

Pseudocode

1. $For\ i \leftarrow 1\ to\ n$
2. $do\ \ maximal\ \leftarrow true$

3. $For\ j\ \leftarrow 1\ to\ n$
4. do
5. $if\ (c[i].x\ \leq c[j].x)\ and\ (c[i].y \leq c[j].y)\ and\ (i \neq j)$
6. $then$
7. $maximal\ \leftarrow false$
8. $break$
9. $end\ if$
10. $end\ for$
11. $if\ (maximal = true)$
12. $then$
13. $Output\ c[i].x, c[i].y$
14. $end\ for$

b) Calculate the worst-case time (running time and memory access) of question 3.a.

[3 marks]

Q4.

a) Let A be an array of (5,2,4,3,10,7,1), and show the merge sort technique on A by illustrating the diagram.

b) Analysis the merge sort algorithm used in above question 4.a.

Hint = $T(n) = \begin{cases} 1\ if\ n = 1 \\ T(\lceil n/2 \rceil) + T(\lfloor n/2 \rfloor)\ +\ n \end{cases}$

[3 marks]