Air University, Islamabad
Department of Computer Science

Computer Programming
Take-Home Exam

Note: The is an individual student task. Place each code in a separate file with a question no as a name. Place all 5 files in a folder and name that folder with your Name_Reg# under assignment on canvas. Also be ready for a demo on Tuesday evening by 2:30 till 4:30. Marking will be based on code as well as a demo. Do bring your laptop while coming for a demo.

QI. Given an array of distinct elements, rearrange the elements of the array in a zig-zag fashion. The converted array should be in form a < b > c < d > e < f. Your program should be using pointers to handle array manipulations.

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Example:
Input:  arr[] = {4, 3, 7, 8, 6, 2, 1}
Output: arr[] = {3, 7, 4, 8, 2, 6, 1}

Input:  arr[] =  {1, 4, 3, 2}
Output: arr[] =  {1, 4, 2, 3}
```

QII. An interval is represented as a combination of start time and end time. Given a set of intervals, check if any two intervals overlap. Create a separate function to determine overlapped combinations.

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Input:  arr[] = {{1,3}, {5,7}, {2,4}, {6,8}}
Output: true
The intervals {1,3} and {2,4} overlap


Input:  arr[] = {{1,3}, {7,9}, {4,6}, {10,13}}
Output: false
No pair of intervals overlap.
```

QIII. Given an array of integers, find all combination of four elements in the array whose sum is equal to a given value X.

For example, if the given array is {10, 2, 3, 4, 5, 9, 7, 8} and X = 23, then your function should print “3 5 7 8” (3 + 5 + 7 + 8 = 23).

QIV. Given an unsorted array of positive integers. Find the number of triangles that can be formed with three different array elements as three sides of triangles. For a triangle to be possible from 3 values, the sum of any two values (or sides) must be greater than the third value (or third side).

For example, if the input array is {4, 6, 3, 7}, the output should be 3. There are three triangles possible {3, 4, 6}, {4, 6, 7} and {3, 6, 7}. Note that {3, 4, 7} is not a possible triangle.

As another example, consider the array {10, 21, 22, 100, 101, 200, 300}. There can be 6 possible triangles: {10, 21, 22}, {21, 100, 101}, {22, 100, 101}, {10, 100, 101}, {100, 101, 200} and {101, 200, 300}

QV. Create a Number game. It will be a two player’s game where you will get some bonus points if you get special numbers. Two players will be a user and computer.

Game Rules:

1. Every player gets 1 turn each.
2. If any player gets ‘1’ then score turns zero
3. If a player gets ‘6’ the same player gets another turn.
4. The game ends on if both players get equal marks or number of turns greater than 15.

QVI. Submit dry run of 2D array sorting code available on canvas.