Projects

General considerations

1- Project responsibility is collective ownership.
2- The project score is out of 15.
3- Maximum number of students is 4.
4- Feel free to use the programming language you prefer.
5- Only the basic mathematical operations are allowed.
6- Predefined functions and libraries are not allowed in the code.
7- Deliver your source code with suitable comments.
8- You are required to explain your code briefly.
9- Deadline is week 12.
10- Cheating is not allowed and could lead you to get 0.
11- Deliverables are: hardcopy, presentation using power point.

Project 1

Write a code that implements two different algorithms to find the minimum distance between two elements in an array. The code should ask the user to enter the array length and its elements.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		Two algorithms are presented clearly	4	
		The code asks the user to enter the array length and its elements	2	
			5	
			5	
			5	

Project 2

Write a code that implements two different strategies to find the greatest common divisor (GCD) between two integers. The first strategy is the brute-force strategy and the second is decrease-and-conquer strategy. The code should ask the user to enter two integers and print their GCD.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		Two algorithms are presented clearly	4	
		The code asks the user to enter the two integers	2	
			5	
			5	
			5	

Project 3

Write a code that implements two different algorithms to check whether two given words are anagrams, i.e., whether one word can be obtained by permuting the letters of the other. For example, the words tea and eat are anagrams. Keep in mind that the words may contain multiple occurrences of the same letter. The code should ask the user to input the two words and print whether they are anagrams.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		Two of the three algorithms are presented clearly	4	
		The code asks the user to enter the two words	2	
			5	
			5	
			5	
			5	

Project 4

Write a code that implements two different algorithms to find the kth smallest element in a list of n numbers (The selection problem). The code should ask the user to input the array length and its elements as well as k and print the kth smallest element.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The two algorithms are presented clearly	4	
		The code asks the user to input the array length and its elements as well as k	2	
			5	
			5	
			5	
			5	

Project 5

Write a code that implements the following:

a. Add elements to a binary search tree, then search for specific element in this tree. The code should ask the user to input the elements of the tree then the element to be searched.
b. Search a string in a text (string matching).

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The two algorithms are presented clearly	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	
			5	

Project 6

Write a code that constructs a graph. The graph will be shown to students in a piece of paper. After creating the graph, the code should check whether the graph is:

a. Connected.
b. acyclic.

The above check will be done using Depth-First-Search (DFS) and implemented by both adjacency matrix and adjacency list.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using both adjacency matrix and adjacency list, and the check is implemented properly	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	
			5	

Project 7

Write a code that constructs a graph. The graph will be shown to students in a piece of paper. After creating the graph, the code should get the minimum-edge path between two vertices and check whether the graph is:

a. Connected.
b. acyclic.

The above check will be done using Breadth-First-Search (BFS) and implemented by both adjacency matrix and adjacency list.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using both adjacency matrix and adjacency list, the check is implemented properly, and the minimum-edge path between two vertices is obtained correctly.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	
			5	

Project 8

Write a code that implements a brute-force strategy for the following problems:

a. Closest-pair problem. The code should ask the user to enter the coordinates of the points then print the closest pair of points.
b. Knapsack problem. The code should ask the user to enter the weight and value of each item, and the maximum capacity of the knapsack. The code then prints the most valuable subset of the items that fit into the knapsack.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented for both algorithms and the results are obtained correctly.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	
			5	

Project 9

Write a code that solves the convex-hull problem using brute-force strategy. The code should ask the user to enter the coordinates of the points. The code then prints the points that form the convex polygon.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using the equation of the line and the results are obtained correctly.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	
			5	

Project 10

Write a code that implements a brute-force strategy for the following problems:

a. Traveling Salesman Problem (TSP). The code should ask the user to enter the coordinates of the cities then prints the shortest tour through these cities.
b. Assignment problem. The code should ask the user to enter persons, jobs, and the cost of assigning each person to each job.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using the equation of the line and the results are obtained correctly.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	

Project 11

Write a code that computes the exponent a^n with three strategies, namely brute-force, decrease-by-a-constant (top down), decrease-by-factor. The code should ask the user to enter both a, n.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using the three mentioned above strategies.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	

Project 12

Write a code that sorts a list of numbers using three algorithms. Two of them are brute-force and the other is decrease-and-conquer. The code should ask the user to enter the list items.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using the three mentioned above algorithms.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	

Project 13

Write a code that implements the following tasks using both recursive and non-recursive algorithms.

a. Factorial computation of an integer.
b. Computing the number of binary digits (bits) required to represent a decimal number.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented using the four mentioned above algorithms.	4	
		Data entry is implemented properly	2	
			5	
			5	

Project 14

Write a code that implements the sets operations (check membership, union, intersection, difference, and complement) as well as inserting/deleting elements to/from list, using the following methods.

a. Universal set.
b. List.

The program should ask the user to enter the elements of the two sets and the operation on these sets.

	Subject	Maximum mark	Actual mark
Project Assessment	Presentation	2	
	Hardcopy	2	
	The code is implemented using the two mentioned methods and the results are correct.	4	
	Data entry is implemented properly	2	
		5	

Project 15

Write a code that implements the addition, subtraction, multiplication operations to two square matrices, and symmetry check for one matrix. The code should ask the user to enter the dimension of the two matrices and elements of them.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented and the results are correct.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	

Project 16

Write a code that finds all subsets of a given set of n elements. The code should ask the user to enter the n and the elements.

		Subject	Maximum mark	Actual mark
Project Assessment		Presentation	2	
		Hardcopy	2	
		The code is implemented, and the results are correct.	4	
		Data entry is implemented properly	2	
			5	
			5	
			5	