SUBJECT: SOFTWARE DESIGN 2		ANNEXURE(S) None	PAGES 2	TIME 3 HRS
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Cape Peninsula University of Technology

FACULTY OF ENGINEERING
ASSESSMENT II: SEMESTER TWO

COURSE: BET: COMPUTER ENGINEERING

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SPECIAL INSTRUCTIONS

1. Answer all questions
2. Write your name and student number in a comment on top of the program
3. Create a new project for each programming problem
4. Zip all files and folders together and submit as one zipped file on Blackboard
5. Be sure to add comments to your program code to make it understandable

QUESTION 1: [24]

Write a Java program to implement a *recursive method* recursiveMinimum that determines the smallest element in an array of integers. As part of the solution, the program will do the following:

- Generate a **10**-element random integer array in the range **10** to **49**
- Use the recursiveMinimum method to determine the smallest element of the array
- Display the generated array on the output window
- Display the smallest element of the array on the output window

QUESTION 2: [25]

The binary search algorithm searches for an element in a sorted array as follows:

- The first iteration checks the element to be searched for against the middle element. If this matches, the algorithm returns the index (or position) of the element in the array
- Assuming that the array is sorted in ascending order, if the search element is less than the middle element of the array, the algorithm discards the upper half of the array and continues the search in the lower half of the array, again checking the search element against the middle element of the new array
- If the search element is greater than the middle element, the lower half of the array is discarded, and the search continues in the upper half of the array
- The algorithm terminates when either the search element is found, or the array size is reduced to zero, meaning that no array element matches the search element

Implement the binary search algorithm described above as a recursive method. Write a Java program to test the recursive binary search algorithm by generating a **10**-element random integer array (in the range **10** to **49**), and requesting a user to enter the integer to search for, and displaying the results of the search on the output window (**Hint**: *you may refer to the implementation of the algorithm in section 19.2.2 in the textbook*).

QUESTION 3: [21]

Implement the recursiveMinimum method specified in question 1 as a generic method. Do this in a new project. Test the operation of the method as follows:

- Generate a **10**-element random double array in the range **1.0** to **49.0**
- Use the GenericRecursiveMinimum method to determine the smallest element of the array
- Display the generated array on the output window
- Display the smallest element of the array on the output window