Lab Assignment, COL100

1. **[Factorial]** Write a recursive C function to compute and return the factorial of its input. The function should take an integer as its input and return its factorial (integer). Test your function by calling it in your main() program to compute the factorial of a number taken from standard input.

2. **[Binary Search]** Write a recursive function to find the index of a given number in a sorted array using the binary search procedure. The prototype of the function is given below.

    int binary_search (int key, int numbers[], int left, int right) {

    /* The function binary_search searches for the integer key in the array numbers from locations left to right (i.e., all the numbers stored from numbers[left] to numbers[right]) and returns the index of the location where the key is found (such that numbers[index] == key) and it returns -1 if the key cannot be found.

    Hint: First compare the key with the number stored at the mid point of left and right, then depending on the outcome, either return the index or recursively call the function for the left or the right half of the array.

    */

3. **[Merge Sort]** The merge sort algorithm sorts an array by first dividing it into two almost equal parts. It then recursively sorts each of the sub-parts. After the two sub-parts have been sorted, it merges the two sub-parts into a sorted array. Write a recursive C program to implement the merge sort algorithm. Test your function by calling it in the main() program and giving it input taken from standard input and print the sorted output. The function prototype that you need to implement is given below:

    void merge_sort(int numbers[], int left, int right) {

    /* This function sorts (in ascending order) the array of numbers from the locations left to right. After the function merge_sort ends the numbers[left] <= numbers[left+1] <= numbers[left +2] …. <= numbers[right]

    */