भारतीय सूचना प्रौद्योगिकी संस्थान गुवाहाटी

Indian Institute of Information Technology Guwahati

DATA STRUCTURES LAB (CS111)

ASSIGNMENTS–08

Optional Assignments

1. There are N elements in an array such that the first N_1 elements are sorted in descending order, and the remaining $N - N_1$ elements are sorted in ascending order. Write a function to sort the array with $O(N)$ time complexity. N and the array elements are user input, but N_1 is not user input.

2. Implement two stacks in an array.

3. Implement a stack using two queues.

4. Implement a queue using two stacks.

5. Consider the following two structures.

```c
struct book_t {
    int   ukey;    /* A unique key assigned to the book.        */
    char *issn;    /* A pointer to the ISSN number of the book. */
    char *name;    /* A pointer to the name of the book.        */
};
struct student_t {
    int   roll;    /* The roll no of the student.               */
    char *name;    /* A pointer to the name of the student.     */
};
```

   Implement a generic singly linked list so that you can store a pointer to either of `book_ t` and `student_t` in any node of the list with the following four operations defined on the list: (i) insert an element at the *i*th location of the list, (ii) delete the element from the *i*th location of the list, (iv) get the element at the *i*th location of the list, (iv) find the length of the list, (v) a generic print function that prints each element of the list, and (vi) a generic sort function that can sort the list using

any of the member variables of the above two structures. Now, Consider a library management system. Say there are b different books (`book_t`) and s number students (`student_t`). Create a list of books and a list of students. Sort and print the lists using `ukey` and roll, respectively.