

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-I Semester (CS/IT/ECE/Civil/BT)

COURSE CODE (CREDITS): 18B11CI211(4)

MAX. MARKS: 25

COURSE NAME: DATA STRUCTURE AND ALGORITHMS MAX. TIME: 1 Hour 30 Min

COURSE INSTRUCTORS: Dr. P.K. Gupta, Dr. Ravindara Bhatt, Dr. Amol Vasudeva, Dr. Ekta Gandotra, Dr. Nishant Jain, Dr. Harsh Sohal

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Design a function having worst case time complexity $O(n)$. Prove your answer with significant justification and calculative steps. [4]

Q2. Consider the doubly linked list where every node has data part, previous pointer (as prev) and next pointer (as next). The following function takes reference to the head of the doubly linked list as an argument. [4]

```
void fun(struct node **head_ref)
{
    struct node *temp = NULL;
    struct node *current = *head_ref;

    while (current != NULL)
    {
        temp = current->prev;
        current->prev = current->next;
        current->next = temp;
        current = current->prev;
    }

    if(temp != NULL)
        *head_ref = temp->prev;
}
```

Find the value of modified doubly linked list after the function call if reference to the head of 1 <--> 2 <--> 3 <--> 4 <--> 5 <--> 6 linked list passed as a parameter to the function. Provide justification to your answer.

Q3. You are given an integer k and a queue of integers. Write an algorithm to reverse the order of the first k elements of the queue, leaving the other elements in the same relative order? For example, if k= 4 and queue has the elements [10, 20, 30, 40, 50, 60, 70, 80, 90]; the output should be [40, 30, 20, 10, 50, 60, 70, 80, 90]. [4]

Q4. In a given function 'f' the operation

[4]

insert(Q, i) — inserts the integer i at the rear of the queue, operation.

delete(Q) — deletes the element from the front and returns its value, and

isEmpty(Q) — returns true if the queue is empty, false otherwise.

```
void f (queue Q) {  
    int i ;  
    if (!isEmpty(Q)) {  
        i = delete(Q);  
        f(Q);  
        insert(Q, i);  
    }  
}
```

Find the output of function f if operations are performed as per above given specifications. Justify your answer.

Q5. The given elements A, B, C, D, E, F, G, H. and I are pushed onto a stack in the same order. The stack is popped six times and each element is inserted into a queue. Three elements are deleted from the queue and pushed back onto the stack. Now, one element is popped from the stack. Find the value of peek element. [4]

Q6. Let us consider that the order of precedence (of operators from highest to lowest) is $^$, $*$, $+$, $-$. Further, $^$ is right associative and the operators $+$, $-$, $*$ are left associative. Write an algorithm that uses a stack for converting a postfix expression into corresponding infix expression. Apply this algorithm on the infix expression $K + L - M * N + (O \wedge P) * W / U / V * T + Q \wedge J \wedge A$ to convert it into postfix expression. [5]