

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2024

B.Tech-2nd Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 18B11CI211 (4)

MAX. MARKS: 25

COURSE NAME: DATA STRUCTURES AND ALGORITHMS

COURSE INSTRUCTORS: PKG, EGA, VKL, KLK, FSL

MAX. TIME: 1 Hr. 30Min.

Note: (a) Attempt all questions in sequential order.

(b) Marks are indicated against each question in square brackets.

(c) There is no syntax error. In case, if you found the same then ignore it and go ahead with the given problem.

Q1. Find the output of following code segment for the given linked list 1->2->3->4->5->6. Justify your answer.

```
void dsa(struct node* start)
```

[CO4] [2]

```
{  
    if(start == NULL)  
        return;  
    printf("%d ", start->data);  
    if(start->next != NULL )  
        dsa(start->next->next);  
    printf("%d ", start->data);  
}
```

Q2. Justify the functioning of following code segment and find the output, if given linked list consist of 100 nodes.

[CO4] [3]

```
int solve (ListNode* list) {  
    ListNode* fast = list;  
    ListNode* slow = list;  
    while(fast->next != NULL && fast->next->next != NULL) {  
        fast = fast->next->next;  
        slow = slow->next;  
    }  
    return slow->data;  
}
```

Q3. Consider the following sequence of operations on an empty stack:

push(54); push(52); pop(); push(55); push(62); s = pop();

Consider the following sequence of operations on an empty queue:

enqueue(21); enqueue(24); dequeue(); enqueue(28); enqueue(32); q = dequeue();

Find the value of $s + q$? Show all steps of your calculation.

[CO4] [2]

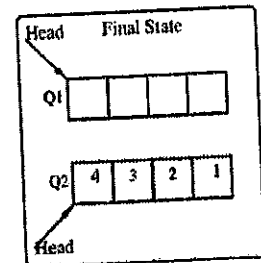
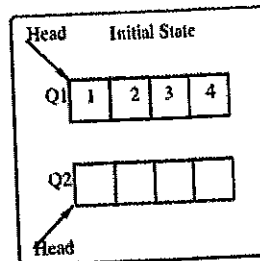
Q4. Let S be a stack of size $n \geq 1$. Starting with the empty stack, suppose we push the first n natural numbers in sequence, and then perform n pop operations. Assume that Push and pop operation take X seconds each, and Y seconds elapse between the end of one such stack operation and the start of the next operation. For $m \geq 1$, define the stack-life of m as the time elapsed from the end of Push(m) to the start of the pop operation that removes m from S . Find out the average stack-life of an element of this stack.

[CO4] [2]

Q5. What is the meaning of $FRONT=REAR \neq -1$ state in Linear Queue. On dequeue what will be the new state of FRONT and REAR. [CO4] [2]

Q6. If min priority queue is implemented with arrays with priorities ranging from 0 to 9. At each priority a maximum of 100 elements can be queued. Give the dimensions and numbers of 1-D and 2-D arrays required for this implementation. [CO4] [2]

Q7. Consider the queues Q1 containing four elements and Q2 containing none (shown as the Initial State in the figure). The only operations allowed on these two queues are Enqueue (Q, element) and Dequeue (Q). Find the minimum number of Enqueue operations on Q1 required to place the elements of Q1 in Q2 in reverse order (shown as the Final State in the figure) without using any additional storage?



[CO4] [3]

Q8. Construct a binary tree whose preorder and inorder traversals are as per following: [CO5] [2]

Preorder: KLNMPRQST

Inorder: NLKPRMSQT

Q9. For a given binary tree of height h, compute the following and provide the justification for your answer: [CO5] [4]

- max # of leaves
- max # of nodes
- min # of leaves
- min # of nodes

Q10. Find the output of the following program. Justify your answer at all steps. [CO4] [3]

```
#include <stdio.h>
int *A, stkTop;
int stkFunc (int opcode, int val)
{
    static int size=0, stkTop=0;
    switch (opcode) {
        case -1: size = val; break;
        case 0: if (stkTop < size) A[stkTop++]=val; break;
        default: if (stkTop) return A[--stkTop];
    }
    return -1;
}
int main()
{
    int B[20]; A=B; stkTop = -1;
    stkFunc (-1, 10);
    stkFunc (0, 5);
    stkFunc (0, 10);
    printf ("%d\n", stkFunc(1, 0)+ stkFunc(1, 0));
}
```