

Continuous Assessment Test - II – October 2023

Programme	: B.Tech	Semester	: Fall 2023 - 2024
Course	: Data Structures and Algorithms	Code	: BCSE202L
Faculty	: Dominic Savio M Vijayaprabakaran K Vatchala S Sudheer Kumar E Ayuthu Avinash Reddy Karthikeyan N Valarmathi K	Slot	: A2+TA2
		Class Number	: CII2023240100659 CII2023240100653 CII2023240101211 CII2023240100657 CII2023240100661 CII2023240100660 CII2023240100655
Time	: 90 Minutes	Max. Marks	: 50

Answer all the Questions

1. a) The in-order and pre-order traversal of binary tree are respectively H, D, I, B, E, A, F, J C, K, G, L and A, B, D, H, I, E C, F, J, G, K, L. Construct the binary tree and find its post-order traversal. [5]
- b) Write an algorithm to construct post-order traversal of binary tree from the given in-order and pre-order respectively. [5] 10
2. Design a hospital patient management system using a queue implemented with a singly linked list. The system should handle patients waiting to be seen by a doctor and support the following operations:
- Enqueue: Add a patient to the queue, assigning a priority to each patient based on their medical condition.
 - Dequeue: Remove a patient from the queue, ensuring that patients with higher medical priority are seen first.
 - Check Empty: Determine whether the patient queue is empty.
 - Count Patients: Retrieve the total number of patients currently in the queue, awaiting medical attention.
3. An anagram is a word or phrase formed by rearranging the letters of a different word or phrase. For example, the word "listen" can be rearranged to form the word "silent".
- | | | |
|--------|--------|---|
| listen | silent | -> l is present in both words, hence l is removed |
| isten | sient | -> i is present in both words, hence i is removed |
| sten | sent | -> s is present in both words, hence s is removed |
| ten | ent | -> t is present in both words, hence t is removed |
| en | en | -> e is present in both words, hence e is removed |
| n | n | -> n is present in both words, hence n is removed |
- The above words are anagram, since both words are empty after removals. 10

A few more examples of an anagram: integral – triangle, low -owl, fluster –restful. Write an algorithm to perform the operations required to complete and check if two words are anagrams of each other using the appropriate data structure in $O(n)$ as time complexity.

Q4 Assume that there exists a non-empty queue Q1, with a set of elements, and non-empty stack S1, that contains a bunch of 1's and 2's in random order. Write an algorithm modify() (With S1 and Q1 as arguments), that returns the modified queue Q2, based on the conditions given below.

1. If the popped element of S1 is 1, then the front element in Q1 becomes the rear element.
2. If the popped element of S1 is 2, then the rear element in Q1 becomes the front element.

Your algorithm should also print the number of positions each element has moved towards front or rear from its original position due to reordering operations. What is the time complexity of your algorithm?

Q1 (front to rear): A, B, C, D, E

S1 (bottom to top): 2, 1, 1, 1, 1, 2

Output Queue (front to rear):

Step 1:

Modified Queue

E A B C D

A B C D E

B C D E A

C D E A B

D E A B C

C D E A B

Step 2

Positions of Elements

A – 3 Positions towards rear

B – 3 Positions towards rear

C – 3 Positions towards front

D – 2 Positions towards front

E - 2 Positions towards front

10

Q5 Consider N Children are playing in the ground and each child is provided a unique ID. The master announces a new game and asks the children to form a circle with the sequential order of unique ID. Now a ball is given to the random person in the circle and that person has to pass the ball to the neighbour person based on the command given by the master. The master will give the direction and number of passes (for example, Forward 4, Forward 3, Backward 2) as command to the children. After number of passes made in each command, the person who holds the ball will be eliminated and the ball will be given to next person in the right. The last person in the game will become the winner of this game.

- a) Illustrate the game with the neat diagram each command execution for the following input

No. of Children = 8; initially ball is given to the child with ID= 3;

Command Array: [F, 3, F, 5, B, 6, F, 1, B, 4, F, 2, B, 2]

Write down the sequence of elimination and winner of the game. [4]

- b) Write an algorithm to imitate this game using circular doubly linked list. [6]

10



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Continuous Assessment Test II – October 2022

Programme	B.Tech. CSE	Semester	FALL 2022-23
Course Code	BCSE202L	Class Nbr	CH2022231001450
Course Title	Data Structures and Algorithms	Slot	A2 + TA2
Faculty	Dr. Gowdham Prabhakar	Max. Marks	50
Time	90 Minutes		

Answer all the Questions (5 X 10 = 50 Marks)

Q. No.	Question	Marks
1.	<p>Let $S = \{ I_1, I_2, \dots, I_n \}$ be a set of ‘n’ closed intervals. The intervals are said to be overlapping if $I_1 \cap I_2 \neq \emptyset$ (non-empty). The overlapping intervals $I_1=[a_1, b_1]$ and $I_2=[a_2, b_2]$ merged as $[\min\{a_1, a_2\}, \max\{b_1, b_2\}]$. For example, $I_1=[2,6]$ and $I_2=[5,7]$ are overlapping intervals and after merging the resultant interval is $[2,7]$. Your task is to merge all the overlapping intervals of S and display all the non overlapping intervals. For example, consider the 6 closed intervals as the input given by user as $[2,6], [3,4], [5,7], [8,9], [9,11], [13,16]$ then the overlapping interval after merging will be $[2,7], [8,11], [13,16]$.</p> <p>Which data structure is most suitable to perform the above task. Write an algorithm by using the mentioned data structure . Illustrate your algorithm for any sample input.</p>	10
2.	<p>There are ‘n’ number of balls in a box. The colors of the balls are red and blue. You are requested to stack the balls in the bottom sealed basket one by one. The order of placing the balls is two consecutive red balls followed by the two consecutive blue balls. Later, create two empty queues. Now, remove the last inserted ball from the basket and place it in the first queue. Similarly remove the next ball from the basket and insert in the second queue. Write an algorithm to repeat this process until the basket is empty and also print the color of the balls in both queues.</p>	10
3.	<p>Create a linked list that consists of integers. Write an algorithm to insert a new element between every pair of two consecutive elements. The new element is the average of two consecutive integers. For example, if the list is $12 \rightarrow 34 \rightarrow 56 \rightarrow 78 \rightarrow 15$, then the average of two consecutive integers 12 and 34 is 23 should be inserted between 12 and 34. The average of 34 and 56 is 45,</p>	10

which should be inserted as shown below: 12 --> 23 --> 34 --> 45 --> 56 --> 67-->78-->46.5--> 15.

4. The distance travelled by the first bus after t seconds is given by the polynomial P_1 while the distance travelled by the second bus after t seconds is given by the polynomial P_2 . Which data structure is most suitable to represent the above scenario. Write an algorithm by using the mentioned data structure to find how far apart will the two buses be after t seconds. For example,

Input

$$P_1: At^2+Bt$$

$$P_2: Qt^2+Pt$$

Output

$$(A-Q) t^2+(B-P) t$$

10

5. Consider the following infix expression
 $(A * B) / C + D - F$

10

Find an equivalent postfix expression. Show the stack content at each step when converting the infix expression to an equivalent postfix expression.

Reg. No.:

Name :



Continuous Assessment Test (CAT) – II – September 2020

Programme	: B.Tech.	Semester	: Fall 2020-2021
Course	: Data Structures and Algorithms	Code	: CSE2002
Faculty	: Dr. Chandan Kumar Behera	Slot/Class No.	: D21+D22+D23/1072
Time	: 1½ hours	Max. Marks	: 50

Answer all the Questions

Q. No.	Question Description	Marks
1	a. Write a recursive function to traverse a singly linked list. b. Mention some drawbacks of the linked list.	7 3
2	a. How to find 3rd element from end in a linked list in one pass? b. Check the given expression: $(a+b)*(c-d)$ to properly parenthesized or not, by using stack?	7 3
3	a. Write the function to delete the first node of a circular doubly linked list. b. Represent pictorially: if a single node present and if no node present in a circular doubly linked list.	6 4
4	Convert the given infix expression into postfix notation by using stack. $(15+16)*4/2-3+20/5$	10
5	a. Write a function to insert an element in a Circular Queue. b. Consider the following function: <pre>void f (queue Q) { int i; if (! isEmpty (Q)) { i = delete (Q); f(Q); insert (Q, i); } }</pre>	5 5

What operation is performed by the above function f ?



Q. No.	Question Description	Marks
1	Write a program to demonstrate insertion and deletion operation in circular queue.	10
2	Write a program to create circular linklist and also make the functions of insertion and deletion procedure.	10

Q1) You are given a linked list, L, and another linked list, P, containing integers, sorted in ascending order. The operation `print_lots(L,P)` will print the elements in L that are in positions specified by P. For instance, if $P = [1, 3, 4, 6]$, the first, third, fourth, and sixth elements in L are printed. Write the routine for `print_lots(L,P)`. (5 M)

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Continuous Assessment Test – II

Course Name : Data Structures and Algorithms
Course Code : CSE 2003
Slot : G1

Exam Duration : 90Min
Maximum Marks:50

Answer All Questions

- Suppose there are two singly linked lists which intersect each other at some point. The start pointers of both lists are known. But the intersecting node position is not known. Also, the numbers of nodes in each of the list before they intersect are unknown and may be different for both lists. Write a program to find the common number, intersection element position in list1, intersection element position in list2 (eg- one list can have 1->45->67->23->12 and another list can have 15->67->59. Then the intersecting point is the node with number 67, 3, 2). (10)

Solution:

Pseudocode for the following interfaces is expected

- a) creation of two linked list
- b) display

c) searching for the common intersection point is expected. Two counters for capturing the position of intersection in both the linked list.

Specifying if no such intersection points are found , the linked list is empty checking can be added.

4) a) You are given a linked list, L, and another linked list, P, containing integers, sorted in ascending order. The operation print_lots(L,P) will print the elements in L that are in positions specified by P. For instance, if P = 1, 3, 4, 6, the first, third, fourth, and sixth elements in L are printed. Write the routine for print_lots(L,P). [CO 3] (5 M)

```
void  
PrintLots( List L, List P )  
{  
int Counter;  
Position Lpos, Ppos;
```

Answer all questions (5*10 = 50)

- Define a structure to accept name and age of N employees to store in a single linked list. Engrave code to create two lists in which one list has age of type odd number and other list has age of type prime number. Display both the lists. [CO3]

Structure of node

```
struct emp
{
    char *name;
    int age;
}*emp1, *emp3;
```

Logic for finding odd and prime and perform insert function inbetween

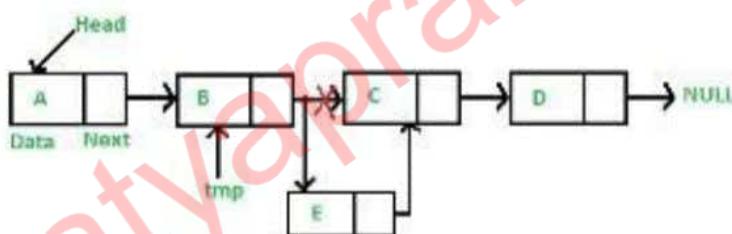
```
void insert (Node** head_ref, int new_data)
```

```
{
    /* 1. allocate node */
    Node* new_node = new Node();

    /* 2. put in the data */
    new_node->data = new_data;

    /* 3. Make next of new node as head */
    new_node->next = (*head_ref);

    /* 4. move the head to point to the new node */
    (*head_ref) = new_node;
}
```



```
void displayList()
{
    struct node *tmp;
    if(stnode == NULL)
    {
        printf(" List is empty.");
    }
}
```

```
void displayList()
{
    struct node *tmp;
    if(stnode == NULL)
    {
        printf(" List is empty.");
    }
    else
    {
        tmp = stnode;
        while(tmp != NULL)
        {
            printf(" Data = %d\n", tmp->num)// prints the data of current
node
            tmp = tmp->nextptr;           // advances the position of current
node
        }
    }
}
```

Answer All Questions

1. Suppose there are two singly linked lists which intersect each other at some point. The start pointers of both lists are known. But the intersecting node position is not known. Also, the numbers of nodes in each of the list before they intersect are unknown and may be different for both lists. Write a program to find the common number, intersection element position in list1, intersection element position in list2
(eg- one list can have 1->45->67->23->12 and another list can have 15->67->59. Then the intersecting point is the node with number 67, 3, 2). (10)

2. a) Suppose a stack implementation supports, in addition to PUSH and POP, an [5] operation REVERSE, which reverses the order of the elements on the stack.

To implement a queue using the above stack implementation, show how to implement ENQUEUE using a single operation and DEQUEUE using a sequence of 3 operations.

- b) The following postfix expression, containing single digit operands and [5] arithmetic operators + and *, is evaluated using a stack. $5 \ 2 \ * \ 3 \ 4 \ + \ 5 \ 2 \ * \ * \ +$

Show the contents of the stack

- (i) After evaluating $5 \ 2 \ * \ 3 \ 4 \ +$
- (ii) After evaluating $5 \ 2 \ * \ 3 \ 4 \ + \ 5 \ 2$
- (iii) At the end of evaluation

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