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Mid Term Examination, Even Semester 2021-22

B.Tech (CSE/CCV/DA/IIOT/AIML/CSF), 2nd Year, 4th Semester

BCSC 0006 / Data Structures and Algorithms

Time: 2 Hours **Maximum Marks: 30**

Instruction for students: Write the complete code in one place neatly. Commenting the code is optional.

Section – A **3 X 5 = 15 Marks**

No.	Detail of Question	Marks	CO	BL	KL
1	a) What do you understand by Linked List? b) What is meant by "stack overflow" condition?	1.5 1.5	CO1	U	C
2	i) The following sequence of operation is performed on a stack: a. push(1),push(2),pop(),push(1),push(2) . pop(),pop(),pop(),push(2), pop(). b. Determine the sequence of popped out values. ii) Take a queue containing numbers 10.15,5,25,30 in which 30 has been inserted first. After performing the following operations. what would be the contents of the queue? a. Delete two elements b. Insert 7 and then 20 c. Delete an element	1.5 1.5	CO2 CO4	A	F

3	Write a program to check whether the given string is palindrome using stack. If the string is palindrome print "yes" else "no".	3	CO2	E	C

3	the string is palindrome print "yes" else "no".	3	CO2	E	C
4	Define Big O notation and what is its utility in analysis of algorithms?	3	CO1	R	C
5	Suppose a linked list named myList. Write a method that inserts a node at the end of the linked list and delete the first node of the linked list. Assume that list has a tail reference as well as head reference.	3	CO3	An	F

Section – B **5 X 3 = 15 Marks**

No.	Detail of Question	Marks	CO	BL	KL
1	a) Write a recursive algorithm to find the factorial of a given number. Explain the advantages and disadvantages of using the recursive formulation compared to non-recursive formulation. b) Study the infix expression given below **a-b/(c+d)*(e-r)** convert this expression into reverse polish notation and show the stack operations for evaluating it.	2.5 2.5	CO2	C,E	C
2	What is data structure? Differentiate between linear and non-linear data structures. Explain all the operations performed on data structure.	5	CO1	U	M
3	What is queue? How is a queue differing from a Stack? Write a program to perform enqueue and dequeue operation by implementing queue using array.	5	CO4	R	P

BCSC 0006: Data Structures & Algorithms

Time: 2 Hours **Maximum Marks: 30**

Section- A

Note: Attempt All Three Questions. **3 x 2 = 6 Marks**

I. Describe Linked-List Data Structure in comparison with an array. Write the code specification for a Node class of
(a) A Singly Linked-List,
(b) A Doubly Linked-List

II. Study the method signature given below

```
public int countNumberOfNodes(Node node) {
    // write your code here
}
```

Complete the body of the method using a recursive approach, to count the number of nodes in a singly linked-list. Show how to call the method inside the main() method of the Main class.

III. Study the in-fix expression given below
A + B * (C - D) / (P - R)
Write the equivalent reverse-polish notation for the above expression.

Section- B

Note: Attempt All Three Questions. **3 x 3 = 9 Marks**

I. Describe a situation in which you would prefer a linked-list data structure for storing and processing elements instead of a standard array. Define the associated best-case and worst-case time complexities while processing the elements of an array and the nodes of a linked-list, which would be more efficient and why?

II. Explain any two real-life programming situations where stacks are used explicitly. What is the role of a stack in each of the two situations and specify why stack is a better choice for the situation?

III. Explain the measures with which we can observe an algorithm as efficient or inefficient. How are the measures used to deduce if an

algorithm is efficient or not? Are the measures used to deduce the complexity of a Data Structure or an Algorithm, why?

Section C

3 x 5 = 15 Marks

Note: Attempt Any Three Questions(Question 1 is compulsory)

I. Suppose there is an organization, which would like to propose work from home for their employees due to Covid-19 restrictions. An Employee of the organization could possibly choose to work from home, on a first-come, first-served, basis, only the first 'K' employees would be allowed to work from home. Now, observe the signature of the method below and complete the following method.

public Queue allotWorkFromHome(LinkedList employees, int k) {}

The method receives a singly linked list of employee types as 'employees' and the number of employees who would be allowed to switch to work from home as 'k' as parameters. The method should take the first 'k' employees from the linked list, whose and put them into a queue and return the queue of employees. Only those employees should be added to the queue whose 'workingFromHome' field is already set to true in the linked-list.

```
public class Employee {
  private String name;
  private boolean workingFromHome;
}
```

II. Write in detail, the algorithm to delete an element whose index is known in a
(a) Singly Linked-List (b) Double Linked-List

III. Explain the term "First-In, First-Out" in context to Data Structures. How can you implement a data structure that follows this FIFO approach? Give an example to implement it on an array data structure.

IV. Implement a Stack using an array. The elements in the stack are to be integers. The operations to be supported are PUSH, POP and TRAVERSE. Take into account the conditions of stack overflow and stack underflow.

Printed Pages: 1 University Roll No.....

First Mid-Term Examination, Even Semester 2019-20

B.Tech (CSE/CCV/DA/CSF/IoT), IInd, IVth

BCSC0006 : Data Structures & Algorithms

Time : 1 Hour Maximum Marks: 15

Section – A

3 x 2 = 6 Marks

1. Explain the benefits of using a Data Structure to store and process data over a standard array. Give an example.
2. Explain the linked-list data structure. Create a Linked-List Node class for a Doubly-Linked List to store the object of a Student class. Assume that the Student class is written for you.
3. What is postfix expression ? Write the postfix expression of

   (A – B) / ((C + D) * E).

Section – B

3 x 3 = 9 Marks

1. Examine the signature of the method given below

```
public void printFibonacciSeries(int n) {
// write your code here
}
```

   Complete this method using recursion to print the first 'n' Fibonacci numbers. Call the method inside a sample Main class.

2. What do you understand by the term "Big O of ..."? What are Algorithmic Complexities? Arrange the most common known complexities in an ascending order.
3. Explain the "Last-In, First-Out" (LIFO) working principle of a Stack? Demonstrate a Stack with code using a Linked-List to store integers.

Programme: B.Tech Branch: CSE Year: II

Subject with Code: Data Structures & Algorithms, BCSC 0006

Time : 1 Hour **Maximum Marks: 15**

Section – A

3 x 2 = 6 Marks

Q1. What are Data Structures? Explain operations that can be performed on data structures.

Q2. Explain the criteria that you will keep in mind while choosing an appropriate algorithm to solve a particular problem.

Q3. What is ADT. Give Example.

Section – B

3 x 3 = 9 Marks

Q1. Write a program to create a queue using arrays which permits insertion and deletion of Book Class object that is having two attributes (Name, Price).

Q2. What do you understand by stack and queue? Explain in detail

Q3. Discuss the significance and limitations of the Big 0 notation.

Printed Pages: **University Roll No.....**

Second Mid-Term Examination, Even Semester 2018-19

B.Tech (CSE/CCV/DA), 2nd Year, 4th Semester

Data Structure & Algorithms : BCSC0006

Time : 1 Hour **Maximum Marks: 15**

Note: Write the complete code in one place neatly. Commenting the code is optional.

Section – A

Three questions of 02 marks each (with no internal choice).3 x 2 = 6 Marks

i. What is a linked list? Discuss the specifications of a node class for a singly linked list, doubly linked list and a circular list.

ii. Why a doubly linked list is more useful than a singly linked list?

iii. Complete the method public int occurrenceCount(int data) of MyLinkedList class, which counts the total number of times the given data is present in the given integer linked list.

Section – B

Three questions of 03 marks each (with no internal choice).3 x 3 = 9 Marks

i. a)Explain how you implement stack and queue using linked list.

1 mark

b) Given a doubly-linked list of integers containing N nodes. Complete the method public void moveMiddleToTop(),to move a middle node of a doubly linked list to the top of the list.

2 marks

```
class Node {
        int data;
        Node next;
        Node previous;
}
class MyDoublyLinkedList {
        Node head;
        public void moveMiddleToTop(){
            // write your code here
```

}

}

ii. a) Write a method to insert a node at the end of a singly linked list. 1 mark

b) Define the process to identify the last node of a singly circular list. Where insertion is permitted at the beginning of the list only. 2 marks

iii. a) Write a method to delete the middle node of a singly linked list. 1 mark

b) List four differences between arrays and linked list. 2 marks