Enrollment No......................................

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

CA5CO34 Data Structures & Algorithms

Programme: MCA   Branch/Specialisation: Computer
Application

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i.   Identify the notation: abc+-de*/.   **1**
           (a) Infix notation   (b) Prefix notation
           (c) Postfix notation   (d) None of these

     ii.   Which of the following is not the correct statement for a stack data   **1**
           structure?
           (a) Arrays can be used to implement the stack
           (b) Stack follows FIFO
           (c) Elements are stored in a sequential manner
           (d) Top of the stack contains the last inserted element

     iii. Rear is always in queue at position where element is _____.   **1**
           (a) Inserted   (b) Deleted   (c) Push   (d) Add

     iv.   When the user tries to delete the element from the empty queue then   **1**
           the condition is said to be a _____.
           (a) Underflow   (b) Overflow
           (c) Garbage collection   (d) Full

     v.   What is the optimal time complexity to count the number of nodes in   **1**
           a linked list?
           (a) O(n)   (b) O(1)   (c) O(log n)   (d) None of these

     vi.   Insertion of an element at the middle of a linked list requires the   **1**
           modification of how many pointers?
           (a) 1   (b) 2   (c) 3   (d) 4

     vii. If the number of records to be sorted is small, then _____ sorting can **1**
           be efficient.
           (a) Merge   (b) Heap   (c) Selection (d) Bubble

                                                                        P.T.O.

viii. Which of the following algorithms is not feasible to implement in a linked list? **1**
    (a) Linear search   (b) Merge sort
    (c) Insertion sort   (d) Binary search

ix. A graph in which all vertices have equal degree is known as _____. **1**
    (a) Complete graph   (b) Regular graph
    (c) Multi graph   (d) Simple graph

x. A graph is a tree if and only if graph is- **1**
    (a) Directed graph   (b) Contains no cycles
    (c) Planar   (d) Completely connected

Q.2 i. If the Input sequence is 1, 2, 3, 4, 5 then, find out the total number of Stackable permutation are there. **2**

ii. Differentiate linear and non-linear data structure with example. **3**

iii. What is recursion? How recursion work in the form of stack justify by using factorial program? **5**

OR iv. Explain the different types of operations on stack in details. Write a program for push operation. **5**

Q.3 i. Explain heap data structure in details. **4**

ii. Explain the algorithm and working of "Tower of Hanoi" problem with solution for 3 discs. **6**

OR iii. Write a program for Insertion – **6**
    (a) Into simple Queue   (b) Into C-Queue

Q.4 i. Differentiate Malloc( ) and Calloc( ) with syntax and example. **3**

ii. Explain and write a program for singly linked list for– **7**
    (a) Inserting four nodes
    (b) Display data of nodes
    (c) Counting total number of node
These operations are executed into single program and also explain its memory representation.

OR iii. Explain and write a program for Doubly linked list- **7**
    (a) Inserting three nodes
    (b) Delete the First node into the list.
These operations are executed into single program and explain with memory representation.

Attempt any two:

Q.5 i. What is binary search? Explain it by using an algorithm. **5**

ii. Write an algorithm for shell sort. Sort the following numbers in ascending order 23, 12, 45, 54, 76, 67, 88, 97, 54 using shell sort. **5**

iii. Write an algorithm to sort N elements using Bubble sort also estimate time and space complexity. **5**

Q.6 i. Let us consider a forest with N vertices and k component then how many edges are there in the forest. **4**

ii. What is Dijkstras algorithm? Explain it by using suitable example. **6**

OR iii. Give the prefix & postfix form of the given expression, also draw its expression tree. **6**
    (a) a + ((b*(c-e))/f)   (b) (a+b)*c-(d-e)*(f+g)

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Marking Scheme
CA5CO34 Data Structure & Algorithm

Q.1	i)	c) postfix notation	1 Mark	**1**	
	ii)	b) Stack follows FIFO	1 Mark	**1**	
	iii)	a) inserted	1 Mark	**1**	
	iv)	a) underflow	1 Mark	**1**	
	v)	a) O(n)	1 Mark	**1**	
	vi)	d) 2	1 Mark	**1**	
	vii)	c) Selection	1 Mark	**1**	
	viii)	d) Binary Search	1 Mark	**1**	
	ix)	b) Regular graph	1 Mark	**1**	
	x)	b) Contains no cycles	1 Mark	**1**	

Q.2	i.	42 by applying catalan formula	2 Marks	**2**
	ii.	Atl east three differences	1 Mark each (1 Mark*3)	**3**
	iii.	Recursion	2 Marks	**5**
		Program	2 Marks	
		Memory representation	1 mark	
OR	iv.	Definition	1 mark	**5**
		Types	2 Marks	
		Program	2 Marks	

Q.3	i.	Definition	2 Marks	**4**
		Max and min heap	2 Marks	
	ii.	Explain	1 Marks	**6**
		Algorithm	3 Marks	
		3 dice shifted	2 Marks	
OR	iii.	Program: - simple Queue	3 Marks	**6**
		CQueue	3 Marks	

Q.4	i.	Syntax	0.5 Marks	**3**
		example	0.5 Marks	
		At least 3 differences	2 Marks	
	ii.	Explanation	1 Marks	**7**
		For each program in which memory representation is include	2 Marks each (2 Marks*3)	

OR	iii.	Explanation	1 Mark	**7**
		For each program in which memory representation is include	3 Marks each (3 Marks*2)	

Q.5	i.	For definition	2 Marks	**5**
		For algorithm	3 Marks	
	ii.	For algorithm	3 Marks	**5**
		For numerical question	2 Marks	
OR	iii.	For algorithm	3 Marks	**5**
		For time and space complexity	2 Marks	

Q.6				
	i.	n-k is correct answer	4 Marks	**4**
	ii.	Algorithm	3 Marks	**6**
		Example	3 Marks	
	iii.	When exactly correct	3 Marks each (3 Marks*2)	**6**

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