Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2018

IT3CO02 Data Structure

Programme: B.Tech. Branch/Specialisation: IT

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. The smallest element of an array's index is called its **1**
(a) Lower Bound (b) Upper Bound
(c) Range (d) Extraction

ii. Which of the following can never be sent by call - by - value? **1**
(a) Variables (b) Structures (c) Arrays (d) Both (b) and (c)

iii. What is the postfix form of the following prefix *+AB-CD **1**
(a) AB+CD-* (b) ABC+D*- (c) AB+*CD- (d) AB*CD+ -

iv. A solution to a 64-disk Towers of Hanoi problem requires how many disks to be moved? **1**
(a) 64 (b) 2^64-1 (c) 2^6-1 (d) 8^2-1

v. In array representation of circular queue, if it contains only one element then **1**
(a) Front = Rear = Null (b) Front = Rear + 1
(c) Front = Rear – 1 (d) Front = Rear

vi. In a circular linked list, insertion of a record involves the modification of **1**
(a) No pointer (b) One pointer
(c) Two pointers (d) Three pointers

vii. Which of the following sorting algorithm is type of external sorting- **1**
(a) Bubble Sort (b) Insertion Sort
(c) Selection Sort (d) Merge Sort

viii. A characteristic of data that binary search uses but the linear search ignores is the **1**
(a) Order of the list (b) Length of the list
(c) Maximum value of the list (d) Mean of the data values

P.T.O.

ix. Maximum possible height of a AVL tree with 7 nodes is **1**
(a) 3 (b) 4 (c) 5 (d) None of these

x. The number of edges in a regular graph of degree d and n vertices is **1**
(a) Maximum of n , d (b) n + d
(c) nd (d) nd/2

Q.2 i. What are the goals of data structure? **2**

ii. Explain recursion. Write a program to find the factorial of a given number. **3**

iii. What is the difference between call-by-value and call-by-reference? Write a program to swap two numbers using both the methods. **5**

OR iv. How two dimensional arrays are stored in memory? If each element of an array DATA[20][50] requires 4 bytes of storage, base address of DATA is 2000, determine the location of DATA[10][10] when the array is stored as **5**
(a) Row Major (b) Column Major

Q.3 i. Why stack is called a LIFO data structure? **2**

ii. What are the operations performed on a stack? Write the code in C/C++. **3**

iii. Give the program/algorithm of recursive version of Tower of Hanoi problem and simplify the simulation to produce a non - recursive version. **5**

OR iv. Write the algorithm to convert the infix expression to its postfix equivalent. Convert the following expression into postfix form: A+(B*C-(D/E-F)*G)*H **5**

Q.4 i. What are the disadvantages of representing a stack or queue by link list? **2**

ii. How a linked list can be implemented using arrays? **3**

iii. Write the algorithm to insert & delete an element in a circular queue. **5**

OR iv. What are the pros & cons of doubly linked list? Write a program to count number of nodes in a circular linked list. **5**

Q.5 i. What is the difference between internal and external sorting? **2**

ii. Why binary search cannot be applied on un-sorted data? Write the algorithm. **3**

iii. Explain garbage collection and compaction in detail. **5**

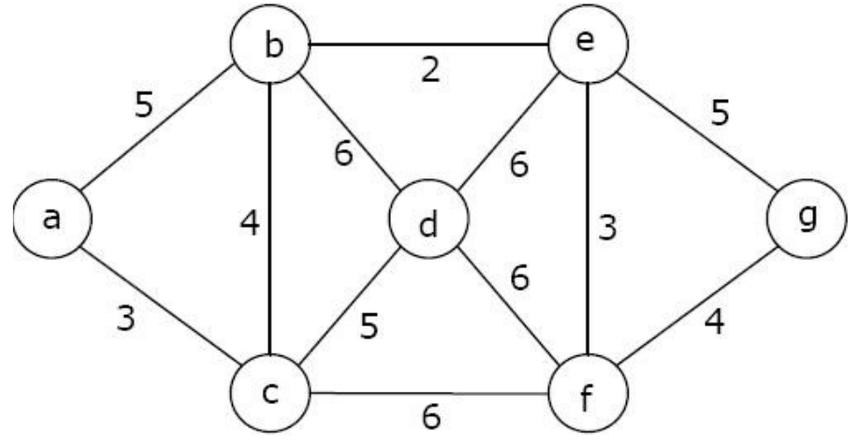
OR iv. Sort the following integers using quick sort and merge sort **5**
25, 57, 48, 37, 12, 92, 86, 33

Q.6 i. Write an algorithm for post order traversal of binary tree. **3**

ii. Following nodes are inserted into empty tree in order 5, 16, 20, 40, 15, 10, 18, 30, 40, 12, 25 construct **7**
(a) AVL Tree (b) Binary Search Tree

OR iii. What is spanning tree? Find minimum spanning tree of the given graph using **7**
(a) Kruskal's Algorithm
(b) Prim's Algorithm

a = Source



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Marking Scheme
IT3CO02 Data Structure

Q.1	i.	The smallest element of an array's index is called its (a) Lower Bound		**1**
	ii.	Which of the following can never be sent by call - by - value? (c) Arrays		**1**
	iii.	What is the postfix form of the following prefix *+AB-CD (a) AB+CD-*		**1**
	iv.	A solution to a 64-disk Towers of Hanoi problem requires how many disks to be moved? (b) 2^64-1		**1**
	v.	In array representation of circular queue, if it contains only one element then (d) Front = Rear		**1**
	vi.	In a circular linked list, insertion of a record involves the modification of (c) Two pointers		**1**
	vii.	Which of the following sorting algorithm does not have a worst case running time of $O(n^2)$ (b) Merge Sort		**1**
	viii.	A characteristic of data that binary search uses but the linear search ignores is the (a) Order of the list		**1**
	ix.	Maximum possible height of a AVL tree with 7 nodes is (a) 3		**1**
	x.	The number of edges in a regular graph of degree d and n vertices is (d) nd/2		**1**
Q.2	i.	Goals of data structure (4 points of 0.5 marks each)		**2**
	ii.	Recursion Definition Program	– 1 mark, - 2 marks	**3**
	iii.	Difference Program	– 2.5 marks – 2.5 marks	**5**
OR	iv.	Two dimensional arrays are stored in memory Row Major and Column Major (1.5*2 = 3 marks)	– 2 Marks – 1.5 marks each	**5**
Q.3	i.	LIFO data structure (Any 4 points – 0.5 marks each)		**2**
	ii.	Operations performed on a stack (any two 0.5 each)– 1 mark Code in C/C++.	 - 2 marks	**3**
	iii.	Problem Definition Simulation	– 1 mark – 4 marks	**5**
OR	iv.	Algorithm Conversion	– 3 marks, – 2 marks	**5**
Q.4	i.	Disadvantage of representing a stack (any two 1 mark each)	-2 marks	**2**
	ii.	How a linked list can be implemented using arrays? Descriptive Answer	 – 3 marks	**3**
	iii.	Two operations 2.5 marks each (2.5 marks * 2)	- 5 marks	**5**
OR	iv.	Pros of doubly linked list (Any two 0.5 each) Cons of doubly linked list (Any two 0.5 each) Program	-1 Mark - 1 Mark – 3 marks	**5**
Q.5	i.	Difference between internal and external sorting (any two) 1 mark each	 - 2 marks	**2**
	ii.	Binary search cannot be applied on un-sorted data Algorithm	- 1 mark - 2 marks	**3**
	iii.	Garbage collection (any 5 points 0.5 marks each) Garbage compaction (any 5 points 0.5 marks each)	- 2.5 marks - 2.5 marks	**5**
OR	iv.	Quick sort Merge sort	- 2.5 marks - 2.5 marks	**5**
Q.6	i.	Algorithm for post order traversal of binary tree 3 marks for correct ans, 1 marks for partially correct/incomplete ans		**3**
	ii.	(i) AVL Tree (ii) Binary Search Tree 3.5 marks for each, 1 mark each for incomplete ans		**7**
OR	iii.	Spanning Tree Definition (i) Kruskal's Algorithm (ii) Prim's Algorithm	– 1 mark - 3 marks - 3 marks	**7**