

(Please write your Exam Roll No.)

Exam Roll No

**Bharti Vidyapeeth's
Institute of Computer Applications and Management
A-4, Paschim Vihar, New Delhi-63**

SECOND SEMESTER [MCA] Internal Examination, February 2018

Paper Code: MCA - 102 **Subject: Data and File Structures**

Time: 2 Hours

Maximum Marks: 45

Note: Attempt THREE questions in all. Question No. 1 is compulsory and attempt one question from each unit.

1. Answer all the following questions briefly:- 1.5 x 10 = 15		
(a)	What are the categories of data structures? Describe various operations performed on data structures.	
(b)	What do you mean by analysis of algorithms? Give the name of main factor which affects the running time of an algorithm.	
(c)	How many stacks are needed to implement a queue. Consider the situation where no other data structure like arrays, linked list is available to you?	
(d)	A single array A[1..MAXSIZE] is used to implement two stacks. Variables top1 and top2 (top1 < top2) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently. What will be the stack full condition?	
(e)	Write "C" code for inserting a node at the end of a Linear Linked List.	
(f)	Describe doubly linked list.	
(g)	What is Deque? Mention the operations which can be performed on a Deque.	
(h)	Explain various properties of a binary tree.	
(i)	Describe (i) Full Binary Tree, (ii) Complete Binary Tree, and (iii) Threaded Binary Tree.	
(j)	Suppose a circular queue of capacity (n - 1) elements is implemented with an array of n elements. Assume that the insertion and deletion operation are carried out using REAR and FRONT as array index variables, respectively. Initially, REAR = FRONT = 0. What will be the conditions to detect queue full and queue empty?	
UNIT - I		
2.	(a) Describe big-oh notation (O) for measuring the time complexity of an algorithm. Compute the time complexity of the following code: <pre>for(i=1; i<=n; i++) { for(j=1; j<=n; j++) { c[i][j] = 1; } }</pre> Also, prove that $10n^2 + 4n + 2 = O(n^2)$.	5
	(b) What are the advantages of using postfix notation to represent a mathematical expression? Convert the mathematical expression: $A + (B * C - (D / E - F) * G) * H$ into postfix notation using stack and show the status after every step in tabular form. Finally, evaluate	5

		the postfix expression by considering A = 10, B = 9, C = 4, D = 8, E = 4, F = 2, G = 3, and H = 7.	
	(c)	Write function in “C” to perform addition of two polynomials.	5
3.	(a)	What are the drawbacks of a linear queue? Write functions in “C” to perform insertion and deletion of an element in a circular queue?	5
	(b)	Write a C function to reverse a doubly linked list.	5
	(c)	Write functions in “C” to delete the nodes from beginning, from specific position, and from the end of a linear linked list.	5
UNIT – II			
4.	(a)	The pre-order and in-order traversals of a binary tree yield the following sequence of nodes: Pre-order: A B E H Q R C D K L M In-order: B Q R H E A D L K M C (i) Draw the binary tree. (ii) What is post-order traversal sequence? (iii) Which are the internal nodes? (iv) Which are the leaf nodes? (v) What is the height of the tree?	5
	(b)	Describe Binary Search Tree (BST). Write function in “C” to perform insertion in BST.	5
	(c)	What are the problems if you insert sorted values in a binary search tree? How these problems are resolved? Demonstrate step-by-step construction of an AVL tree by inserting the following values: 14, 19, 23, 9, 12, 6, 29, 35.	5
5.	(a)	Which traversal of BST gives the element in sorted order? Write a function .in C to count the number of leaves in a BST. The in-order traversal of a BST is, 40,42,45,46, 50. Assume left child of the root is NULL. What should be the root of the three?	5
	(b)	Define in-order successor. Write a function in C (i) To check whether two elements have same parent. (ii) To find an in-order successor of a given element.	5
	(c)	Write a function to delete an element having two children in BST	5

*****Best of Luck*****