

**(Department of Computer Applications)****MCA 2 Semester****Pre-University Examination. (2021-22) Even Semester****Data Structures and Analysis of Algorithms (KCA205)****Duration: 3 hrs****Max. Marks: 100****Note: - Attempt all the Questions from each section.**

Section-A		(2*10=20)		
Q. No.	Question	Competitive Exam	CO	BL/KC*
1.	a Determine the worst-case time complexity of inserting n elements into an empty linked list, if the linked list needs to be maintained in sorted order?	GATE CSE 2020	1	3/P
	b An n*n array V is defined as follows V[i,j]=i-j for all i,j, 1<=i<=n; 1<=j<=n; Calculate the sum of the elements of the array V is_____.	GATE CSE 2020	1	3/P
	c Explain how priority queue can be implemented using heap data structure?		2	2/C
	d Compute the result evaluating the postfix expression 10 5 + 60 6/ * 8 - is_____.	GATE CSE 2015	2	3/P
	e Illustrate when a sorting technique is called stable?	GATE CSE 1999.	3	3/P
	f Consider the array A = <4, 1, 3, 2, 16, 9, 10, 14, 8, 7>. After building heap from the array A, determine the depth of the heap and the right child of max-heap. (Root is at level 0).	UGC NET 2018	3	3/P
	g The postorder traversal of a binary tree is 8,9,6,7,4,5,2,3,1. The inorder traversal of the same tree is 8,6,9,4,7,2,5,1,3. The height of a tree is the length of the longest path from the root to any leaf. Predict the height of the binary tree is_____.	GATE CSE 2018	4	3/P
	h The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. Calculate the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?	GATE CSE 2004	4	3/P
	i Differentiate between Graph and tree.		5	2/C
	j Describe multigraph.		5	1/C
Section-B		(5*6=30)		
Q. No.	Question	Competitive Exam	CO	BL/KC*
2	What do you understand by _____ and _____		1	2/C

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b y t i m e s p a c e t r a d e o f f ? <b>E</b> <b>x</b> <b>p</b> <b>l</b> <b>a</b> <b>i</b> <b>n</b> b e s t , w o r s t a n d a v e r a g e c a s e a n a l y s i s i n t h i s r e s p e c t w			
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	it h a n e x a m p l e			
	O R			
	A n a rr a y A rr [ 5 0 ][ 1 0 0 ] is st o r e d i n t h e m e m o r y a l o n g t h e r o w m a j o r w it h e			

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a c h e l e m e n t o c c u p y i n g 2 b y t e s o f m e m o r y . <b>E</b> <b>s</b> <b>t</b> <b>i</b> <b>m</b> <b>a</b> <b>t</b> <b>e</b> <b>t</b> <b>h</b> <b>e</b> <b>a</b> <b>d</b> <b>d</b> <b>r</b> <b>e</b> <b>s</b> <b>s</b> <b>o</b> <b>f</b> <b>t</b> <b>h</b> <b>e</b> <b>l</b> <b>o</b> <b>c</b> <b>a</b> <b>t</b> <b>i</b> <b>o</b> <b>n</b> <b>A</b> <b>r</b> r			
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	20150], if the location of Arr[10][25] is stored at the address 0000.		
3	Demonstrate a fu	2	3/P

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n c t i o n t o p e r f o r m e n q u e u e o p e r a t i o n i n l i n e a r q u e u e . A l s o g i v e t h e l i m i t a t i o n s o f l i n e a r			
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q u e s t i o n			
O R			
H o w r e c u r r e n t f r o m i t e r a t i o n ? D e f i n e b e l o w i s t h e A c k e r m a n f u n c t i o n			

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	ti o n , c o m p u t e t h e v a l u e o f A ( 1 , 2 ).		
4	G i v e p r e -r e q u i s i t e o f b i n a r y s e a r c h a l g o r i	3	4/C

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t h m . I l l u s t r a t e a r e c u r s i v e c a l l t o i m p l e m e n t B i n a r y s e a r c h . A l s o d i s c u s s t h e c o m p l			
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e x i t y o f a l g o r i t h m .			
O R			
E x p l a i n Q u i c k s o r t a l g o r i t h m , a l s o d i s c u s s i t s t i m e c o m p l e x i t y .			

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5	What is the identified reference between binary systems architecture (BST) and the gap? For a given sequence			
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e n c o f n u m b e r s, c o n s t r u c t a m a x h e a p a n d a B S T . 3 4 , 2 3 , 6 7 , 4 5 , 1 2 , 5 4 , 8 7 , 4 3 , 9 8			
O R			

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	<p>G i v e n t h e f o l l o w i n g e x p r e s s i o n t r e e , c o m p u t e t h e a r i t h m e t i c e x p r e s s i o n .</p>			
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a

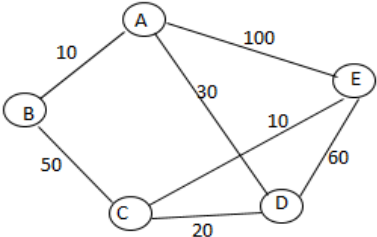
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6	D e m o n s t r a t e B r e a d t h F ir st S e a r c h ( B F S ) a l g o r i t h m t o t r a v e r s e a g r a p h .			
	O R			
	I l l u s t r a t			

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e t h e c o n c e p t o f L o n g e s t C o m m o n S u b - s e q u e n c e ( L C S ) b y g i v i n g s u i t a b l e e x a m p l e .			
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Section-C		(5*10=50)		
Q. No.	Question	Com petiti ve Exa m	CO	BL/ KC*
7	<b>Discuss</b> a function in C to perform arithmetic addition on polynomials. Also give time complexity of the function.		1	2/C
	OR			
	What is Sparse matrix? <b>Explain</b> how a Sparse matrix can be implemented by using the linked list?			
8	Write an algorithm(s) to perform Push and Pop operations onto the Stack. <b>Determine</b> the postfix of following infix expression: $A + (B * C - (D / E \uparrow F) * G) * H$ .		2	3/P
	OR			
	<b>Demonstrate</b> the ways in which the hash function can be defined. Explain collision resolution technique used in Hashing.			
9	<b>Illustrate</b> a function to implement heap sort. Give its time complexity.		3	3/P
	OR			
	Write a function for bubble sort. <b>Apply</b> bubble sort on following unsorted array of integers. <b>5, 1, 7, 3, 2, 8, 2, 4, 6, 9.</b>			
10	What is height balanced tree? Why height balancing of tree is required? <b>Create</b> an AVL tree for the following elements: A, Z, B, Y, C, X, D, W, E, V, F		4	5/P
	OR			
	Define B-Tree. <b>Construct</b> a B-Tree of order 5 by inserting following elements: 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, 29			
11	Describe Dijkstra's algorithm for finding shortest path. <b>Apply</b> the algorithm on the following graph:		5	4/P
				
	OR			
11	<b>Apply</b> Kruskal's and Prism's algorithm to find the minimum spanning tree in the following given graph.			
	