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Degree: B. TECH (PVP20)	II			II		B.	Tech -	- CSE		3 НО	URS
Course Code: 20CS3552	SUBJECT: ADVA LAB	DVANCED DATA STRUCTURES						Ir Ez			
DEPARTMENT: CSE	DATE OF EXA	AM: 09-05-2023						AC	Year	r: 2022	2-23
Instructions:	low question. nents describing each figuration parameters	section	n of it.	If sce	nario,	Marks)	s	SET:	1	-

Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Choose appropriate collision resolution technique amongst the following and justify your answer

- a. Separate chaining
- b. Linear probing.
- c. Quadratic probing.
- d. Double hashing with second hash function $h2(x) = 7 (x \mod 7)$.

- 1. Define Binary Tree
- 2. Define Tree Data Structure
- 3. Name some characteristics of Array Data Structure
- 4. What is Hash Table?
- 5. What is Heap?
- 6. What is Priority Queue?
- 7. What is a Graph?
- 8. Under what circumstances are Linked Lists useful?
- 9. What are Dynamic Arrays?
- 10. What is Binary Heap?

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Degree: B. TECH (PVP20)	II			II		B.	Tech -	- CSE		3 но	URS
Course Code: 20CS3552	SUBJECT: AD LAB	VANO	CED D	OATA	STRU	J CTU F	RES	Internal Lab Examination AC Year: 2022-2			
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	5-2023				A	2-23		
Instructions: • Aim, Short Description/Procedure (1.5 M statement has to be written for the below • Write the Program legibly with comment each and every step with configuration p • There shall be no change in program. • Kindly Answer the Viva Voce Questions	question. as describing each arameters.	section	n of it.	If scen	nario,		,		SET:	2)

Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Choose appropriate collision resolution technique amongst the following and justify your answer

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Degree: B. TECH (PVP20)	II			II		B.	Tech -	- CSE		3 но	URS
Course Code: 20CS3552	SUBJECT: AD LAB	VANO	CED D	OATA	STRU	J CTU F	RES	Internal Lab Examination AC Year: 2022-2			
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Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Choose appropriate collision resolution technique amongst the following and justify your answer

- a. Separate chaining
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- 1. Define Binary Tree
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Course Code: 20CS3552	SUBJECT: AD LAB	VANO	CED D	ATA	STRU	CTUF	RES	I E	o n		
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	5-2023				A	2-23		
 Instructions: Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question. Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters. There shall be no change in program. Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks) 										4	

Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Assume linear probing collision resolution technique is chosen to avoid collisions. Now Apply Rehash using an appropriate table size N with a hash function of $h(x) = x \mod N$, to decrease number of collisions.

- 1. Define Binary Tree
- Define Tree Data Structure
- 3. Name some characteristics of Array Data Structure4. What is Hash Table?5. What is Heap?

- 6. What is Priority Queue?
- 7. What is a Graph?
- 8. Under what circumstances are Linked Lists useful?
- 9. What are Dynamic Arrays?
- 10. What is Binary Heap?

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Degree: B. TECH (PVP20)	II			II		B.	Tech -	- CSE		3 но	URS
Course Code: 20CS3552	SUBJECT: AD LAB	VANO	VANCED DATA STRUCTURES					_			
DEPARTMENT: CSE	DATE OF EX	KAM: 09-05-2023						Internal Lab Examination AC Year: 2022-			2-23
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Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Assume quadratic probing collision resolution technique is chosen to avoid collisions. Now Apply Rehash using an appropriate table size N with a hash function of $h(x) = x \mod N$. to decrease number of collisions.

- 1. What is Complexity Analysis of Priority Queue operations?
- 2. What is the space complexity of a Hash Table?
- 3. What's the difference between the data structure Tree and Graph?
- 4. Compare Heaps vs Arrays to implement Priority Queue
- 5. What is AVL Tree?
- 6. What is Balanced Tree and why is that important?
- 7. What is an Associative Array?
- 8. What is complexity of Hash Table?
- 9. Explain what is B-Tree?
- 10. How To Choose Between a Hash Table and a Trie (Prefix Tree)?

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Course Code: 20CS3552	SUBJECT: AD LAB	OVANCED DATA STRUCTURE					RES	_		al Lal natio	_
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	5-2023				A	2-23		
 Instructions: Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question. Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters. There shall be no change in program. Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks) 										6	

Given input $\{\}$ and a hash function $h(x) = x \mod 10$, Assume separate chaining collision resolution technique is chosen to avoid collisions. Now Apply Rehash using an appropriate table size N with a hash function of $h(x) = x \mod N$. to decrease number of collisions.

- 1. What is Complexity Analysis of Priority Queue operations?
- 2. What is the space complexity of a Hash Table?
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Course Code: 20CS3552	SUBJECT: AD LAB	VAN(CED D	OATA	STRU	J CTU F	RES	Internal Lab Examination AC Year: 2022-2			_
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Implement topological sort and Identify a stack / queue is used for the topological sort in your implementation Does the ordering result changes from a stack or queue? Why might one data structure give a "better" answer?

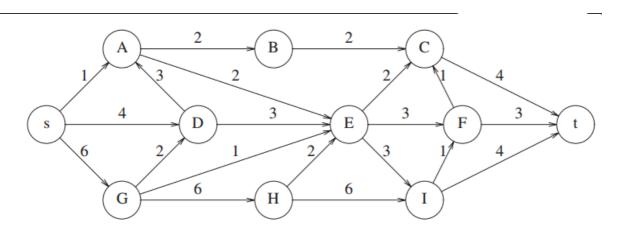


Figure 9.81 Graph used in Exercises 9.1 and 9.11

- 1. What is Complexity Analysis of Priority Queue operations?
- 2. What is the space complexity of a Hash Table?
- 3. What's the difference between the data structure Tree and Graph?
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Implement topological sort and Identify justify your answer If a stack / queue is used for the topological sort what is the different ordering result? Why might one data structure give a "better" answer?

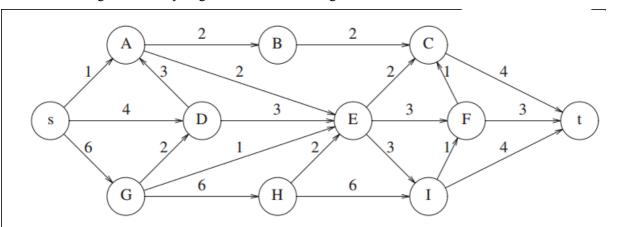


Figure 9.81 Graph used in Exercises 9.1 and 9.11

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TECHNOLOGY	YEAR		SEM	ESTE	R	P	rogra	mme	nme DURATI		ΓΙΟΝ
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Course Code: 20CS3552	SUBJECT: AD LAB	VANC	ED D	ATA	STRU	CTUF	RES	I E	b n		
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	-2023				A	2-23		
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Choose appropriate data structure if I wanted to have a *quick access to the largest (or smallest) item* in a list of items Justify why that structure is used.

- 1. What are some main advantages of binomial queues
- 2. Compare lookup operation in Binomial queues
- 3. How are B-Trees used in practice?
- 4. What are the various applications of Data structures
- 5. Explain the difference between file structure and storage structure?
- 6. What is hashmap in data structure? What is the time complexity of basic operations get() and put() in HashMap class?
- 7. What is the maximum number of nodes in a binary tree of height k?
- 8. Write a recursive function to calculate the height of a binary tree?
- 9. What is topological sorting in a graph?
- 10. What is the difference between backtracking and a brute force one?

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 Instructions: Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question. Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters. There shall be no change in program. Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks) 									SET:	

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Course Code: 20CS3552	SUBJECT: AD LAB	VANCED	RES	_	nal Lal inatio	_				
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Instructions: • Aim, Short Description/Procedure (1.5 N statement has to be written for the below • Write the Program legibly with comment each and every step with configuration p • There shall be no change in program. • Kindly Answer the Viva Voce Questions			SET:							

Choose an appropriate data structure to access a min or max element in constant time from a list of elements

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- 2. Compare lookup operation in Binomial queues
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Course Code: 20CS3552	SUBJECT: AD LAB	VANO	CED D	ATA	STRU	RES		nterr Exami						
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	5-2023				AC Year: 2022-2						
 Instructions: Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question. Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters. There shall be no change in program. Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks) 									1	SET:				

Choose an appropriate data structure that maintains data in a *semiordered and which is* a good tradeoff between the cost of maintaining a complete order ant the cost of seaching through random chaos.

- 1. What are some main advantages of binomial queues
- 2. Compare lookup operation in Binomial queues
- 3. How are B-Trees used in practice?
- 4. What are the various applications of Data structures
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 Instructions: Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with comment each and every step with configuration p There shall be no change in program. Kindly Answer the Viva Voce Questions 		1	SET:	}								

Choose an appropriate data structure for efficient implementation of an abstract data type called a priority queue,.

- 1. What is the advantage of using Bellman-Ford over Dijkstra?
- 2. What is the minimum number of queues needed when implementing a priority queue?
- 3. How do you find the duplicate number on a given integer array?
- 4. Can you store a duplicate key in Hashmap?
- 5. What are the differences between B tree and B+ tree?
- 6. Compare lookup operation in AVL tree vs Red Black tree
- 7. What is the difference between Hashing and Hash Tables?
- 8. When would you want to use a Heap data structure?
- 9. Why is a Hash Table not used instead of a B-Tree in order to access data inside a database?
- 10. Difference between Hashmap and Hashtable

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DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023								C Yea	r: 202	2-23									
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Choose an appropriate data structure to access a min or max element in constant time from a list of elements

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Choose an appropriate data structure for efficient implementation of an abstract data type called a priority queue

- 1. can Min heap can be used to implement selection sort?
- 2. What is hashmap in data structure?
- 3. What is the requirement for an object to be used as key or value in HashMap?
- 4. What is the complexity of Insertion operations in Binomial queues and Priority queues
- 5. Whn does Binomial queues preferred over priority queus
- 6. What is a priority queue? What are the applications for priority queue?
- 7. Compare different implementations of priority queue
- 8. What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?
- 9. What is a B-tree data structure? What are the applications?

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- 9. What is a B-tree data structure? What are the applications.
- 10. Define Red-Black Tree and its applications

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TECHNOLOGY	YEAR		SEMESTER Progra				rogra	mme	D	URA	TION
Degree: B. TECH (PVP20)	П	II B.Tech						- CSE		3 НО	URS
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB								Internal Lab Examination		
DEPARTMENT: CSE	DATE OF EX	XAM:	09-05	5-2023				A	C Yea	r: 202	22-23
Instructions:									S	ET:	
 Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with commen each and every step with configuration p There shall be no change in program. 	question. ts describing each		1	{	3						

Choose an appropriate data structure when you need to remove the object with the highest (or lowest) priority.

Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

- 1. Which data structures are used for implementing LRU cache?
- 2. Write a program to remove duplicates from a sorted array in place?
- 3. Write a function to merge two sorted binary search tree
- 4. Write a recursive function to calculate the height of a binary tree \
- 5. What is topological sorting in a graph?
- 6. How can memory be saved when storing color information in a Red-Black tree?
- 7. which of the data structures is best for searching words in dictionaries?
- 8. How do you check if a given binary tree is a subtree of another binary tree?
- 9. How do you find if two trees are identical?
- 10. How are binary trees used for data compression?

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:			5	0		A	0	5			
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TECHNOLOGY	YEAR	SEMESTER	Progra	mme	DURATION				
Degree: B. TECH (PVP20)	II	II	B.Tech	- CSE	3 HOURS				
Course Code: 20CS3552	SUBJECT: AD LAB	ECT: ADVANCED DATA STRUCTURES Interna Examin							
DEPARTMENT: CSE	DATE OF EX	XAM: 09-05-2023		A	C Year: 2022-23				
Instructions: • Aim, Short Description/Procedure (1.5 N statement has to be written for the below		ask Steps and Result (1.5	Marks)		SET:				

each and every step with configuration parameters.There shall be no change in program.

• Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Write the Program legibly with comments describing each section of it. If scenario, describe

19

Program/Task:

Choose an appropriate data structure when you need to remove the object with the highest (or lowest) priority.

- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- How are binary trees used for data compression?

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:		5	0		A	0	5		
	YEAR	SEM	ESTE	R	P	rogra	mme	D	URA	ΓΙΟΝ

Degree: B. TECH (PVP20)	II	II	- CSE	3 HOURS	
Course Code: 20CS3552	SUBJECT: AD LAB	VANCED DATA STRU	CTURES	_	nternal Lab Examination
DEPARTMENT: CSE	DATE OF EX	XAM: 09-05-2023		A	C Year: 2022-23
 Instructions: Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with comment each and every step with configuration point. There shall be no change in program. Kindly Answer the Viva Voce Questions 	question. as describing each arameters.	section of it. If scenario, o	,	,	SET: 20

Choose an appropriate data structure to sort the following number with worst case time complexity of O(n log n).

- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- How are binary trees used for data compression?

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:			5	0		A	0	5			
TECHNOLOGY	YEAR		SEM	ESTE	R	P	rogra	mme	D	URA	ΓΙΟΝ	
Degree: B. TECH (PVP20)	II		II		II		В.	Tech -	- CSE		3 НО	URS

(Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB	Internal Lab Examination
I	DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
I	nstructions: • Aim, Short Description/Procedure (1.5 M statement has to be written for the below	farks), Program/Task Steps and Result (1.5 Marks) question.	SET:
		s describing each section of it. If scenario, describe arameters.	21

Choose an appropriate data structure to sort the following number with worst case time complexity of O(n log n).

- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- How are binary trees used for data compression?

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:		0	A		0	5					
TECHNOLOGI	YEAR	SEM	1ESTE	R	P	rogra	mme	mme DURAT				
Degree: B. TECH (PVP20)	II		П		В.	Tech -	- CSE	E 3 HOURS				
Course Code: 20CS3552	SUBJECT: AD	Internal Lab Examination										
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023							AC Year: 2022				
Instructions:								S	ET:			
 Aim, Short Description/Procedure (1.5 N statement has to be written for the below Write the Program legibly with commen each and every step with configuration procedure. 	question. ts describing each	•		·			•	7				

There shall be no change in program.

Sometimes a binary search tree, may be skewed tree, so in worst case BST searching, insertion and deletion complexity = O(n). In the above scenario Choose an appropriate data structure with a time complexity of searching, insertion and deletion = O(logn).

Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- How are binary trees used for data compression?

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TECHNOLOGY	YEAR	SEMESTER	Progra	mme	DURATION									
Degree: B. TECH (PVP20)	II	II	B.Tech	B.Tech - CSE 3 HO										
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB									e: 20CS3552 SUBJECT: ADVANCED DATA STRUCTURES				nternal Lab Examination
DEPARTMENT: CSE	DATE OF EX	XAM: 09-05-2023		A	C Year: 2022-23									
Instructions:	4 1) D //T	1 D 1 (1.5	N. (. 1.)		SET:									
 Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with commente each and every step with configuration p 	question. ts describing each	`	,	/	73									

There shall be no change in program.

Sometimes a binary search tree, may be skewed tree, so in worst case BST searching, insertion and deletion complexity = O(n). In the above scenario Choose an appropriate data structure with a time complexity of searching, insertion and deletion = O(logn).

Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
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- How do you find if two trees are identical?
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	YEAR	SEMESTER	Programmo	DURATION					
Degree: B. TECH (PVP20)	П	II	B.Tech - CS	E 3 HOURS					
Course Code: 20CS3552	SUBJECT: AD LAB	SUBJECT: ADVANCED DATA STRUCTURES LAB							
DEPARTMENT: CSE	NT: CSE DATE OF EXAM: 09-05-2023								
Instructions	•			SET:					

Instructions:

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Program/Task:

Given a skew tree . what will be the time complexity to balance the tree? What will be the algorithm for this?

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
- What is rehashing
- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
- What are various collision handling methods in hashing
- What is the disadvantage of separate chaining hashing method
- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation

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TECHNOLOGY	YEAR	YEAR SEMESTER Progra							
Degree: B. TECH (PVP20)	II	II	B.Tech -	CSE	3 HOURS				
Course Code: 20CS3552	SUBJECT: AD LAB	SUBJECT: ADVANCED DATA STRUCTURES LAB							
DEPARTMENT: CSE	DATE OF EX	DATE OF EXAM: 09-05-2023							
Instructions:	(1.5 Martla) Durana /T	Carla Chama and Danielle (1.5	Mada		SET:				

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

25

Program/Task:

Consider a situation with a number of persons and the following tasks to be performed on them:

- Add a new friendship relation, i.e. a person x becomes the friend of another person y i.e adding new element to a set.
- Find whether individual x is a friend of individual y (direct or indirect friend)
- Find whether x and y belong to the same group or not, i.e. to find if x and y are direct/indirect friends.

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
- What is rehashing
- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
- What are various collision handling methods in hashing
- What is the disadvantage of separate chaining hashing method
- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation.

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:		5	0		A	0	5		
TECHNOLOGY	YEAR	SEM	ESTE	R	P	rogra	mme	D	URAT	ΓΙΟΝ

Degree: B. TECH (PVP20)	II	B.Tech -	CSE	3 HOURS					
Course Code: 20CS3552	LAB								
DEPARTMENT: CSE	ENT: CSE DATE OF EXAM: 09-05-2023								
 Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with comment each and every step with configuration portion. There shall be no change in program. Kindly Answer the Viva Voce Questions 	question. s describing each arameters.	section of it. If scenario,	,		SET: 26				

We are given 10 individuals say, a, b, c, d, e, f, g, h, i, j

Following are relationships to be added:

a <-> b

b <-> d

c < -> f

c <-> i

j <-> e

 $g \leftarrow j$

Given queries like whether a is a friend of d or not.

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
- What is rehashing
- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
- What are various collision handling methods in hashing
- What is the disadvantage of separate chaining hashing method
- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:		5	0		A	0	5		
	YEAR	SEM	ESTE	R	P	rogra	mme	D	URA	ΓΙΟΝ

Degree: B. TECH (PVP20)	- CSE 3 HOURS				
Course Code: 20CS3552		nternal Lab xamination			
DEPARTMENT: CSE		AC Year: 2022-2			
Instructions:					SET:
 Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with comment each and every step with configuration portain. There shall be no change in program. Kindly Answer the Viva Voce Questions 	question. s describing each arameters.	section of it. If scenario, o	,		27

Consider a situation with a number of persons and the following tasks to be performed on them:

- Add a new friendship relation, i.e. a person x becomes the friend of another person y i.e adding new element to a set.
- Find whether individual x is a friend of individual y (direct or indirect friend)
- Find whether x and y belong to the same group or not, i.e. to find if x and y are direct/indirect friends.

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
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- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
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- What is the disadvantage of separate chaining hashing method
- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:		5	0		A	0	5		
	YEAR	SEMESTER				Programme			DURATION	
Degree: B. TECH (PVP20)	II	II			B.	Tech -	- CSE		3 НО	URS

			L				
Course Code: 20CS3552	Code: 20CS3552 SUBJECT: ADVANCED DATA STRUCTURES LAB						
DEPARTMENT: CSE	DATE OF EX	AC Year: 2022-23					
 Instructions: Aim, Short Description/Procedure (1.5 M statement has to be written for the below Write the Program legibly with comment each and every step with configuration p There shall be no change in program. Kindly Answer the Viva Voce Questions 	question. ts describing each parameters.	section of it. If scenario,		SET: 28			

We are given 10 individuals say, a, b, c, d, e, f, g, h, i, j

Following are relationships to be added:

a <-> b b <-> d c <-> f c <-> i

j <-> e

 $g \leftarrow > j$

Given queries like whether a is a friend of d or not.

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
- What is rehashing
- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
- What are various collision handling methods in hashing
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- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:		5	0		A	0	5		
TECHNOLOGY	YEAR	SEM	ESTE	R	P	rogra	mme	D	URA	ΓΙΟΝ
Degree: B. TECH (PVP20)	II		П		В.	Tech -	- CSE		3 но	URS

Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB	Internal Lab Examination
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
statement has to be written for the below	arameters.	SET: 29

Let's say there are 5 people A, B, C, D E. A is a friend of B, B is a friend of C and D is a friend of E. As we can see:

- 1) A, B and C are connected to each other.
- 2) D and E are connected to each other.

use appropriate Data Structure to check whether one friend is connected to another in a direct or indirect way or not.

- How to handle duplicate nodes in a binary search tree?
- Can binary search be used for the linked list?
- What is rehashing
- Compare Naïve patters searching with Robin krap pattern searching algorithms
- What is the time complexity of Kunth morris pratt pattern searching algorithm
- What are various collision handling methods in hashing
- What is the disadvantage of separate chaining hashing method
- What is the complexity of Floyd warhalls algorithm
- What is the best method to join two disjoint sets
- Give an example for an equivalence relation

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:		5 0			A 0		5			
TECHNOLOGY	YEAR	·	SEMESTER		ER Progra		Programme		DURATION		
Degree: B. TECH (PVP20)	II		II		II B		Tech -	- CSE		3 НО	URS
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Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB	Examination
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
statement has to be written for the below	ts describing each section of it. If scenario, describe arameters.	30

Let's say there are 5 people A, B, C, D E. A is a friend of B, B is a friend of C and D is a friend of E. As we can see:

- 1) A, B and C are connected to each other.
- 2) D and E are connected to each other.

use appropriate Data Structure to check whether one friend is connected to another in a direct or indirect way or not.

Viva Questions:

- can Min heap can be used to implement selection sort?
- What is hashmap in data structure?
- 3. What is the requirement for an object to be used as key or value in HashMap?
- 4. What is the complexity of Insertion operations in Binomial queues and Priority queues
- 5. Whn does Binomial queues preferred over priority queus
- 6. What is a priority queue? What are the applications for priority queue?
- 7. Compare different implementations of priority queue
- 8. What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?

LAB

- 9. What is a B-tree data structure? What are the applications.
- 10. Define Red-Black Tree and its applications

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:		5	0		A	0	5		
TECHNOLOGY	YEAR	SEMESTER Prog				rogra	mme	nme DURATION		
Degree: B. TECH (PVP20)	II		II B.Tech				- CSE		3 HOURS	
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES Examin									

DEPARTMENT: CSE

DATE OF EXAM: 09-05-2023

AC Year: 2022-23

Instructions:

• Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.

• Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.

Program/Task:

Let's say there are 5 people A, B, C, D E. A is a friend of B, B is a friend of C and D is a friend of E. As we can see:

1) A, B and C are connected to each other.

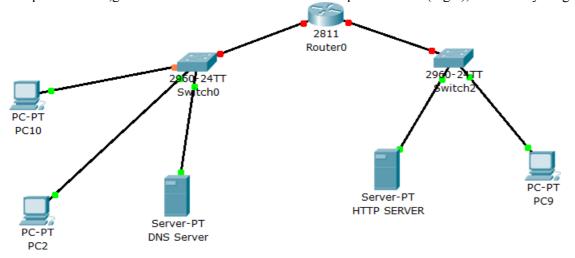
There shall be no change in program.

2) D and E are connected to each other.

use appropriate Data Structure to check whether one friend is connected to another in a direct or indirect way or not.

And the implementation, guarantees that all the trees will have depth at most O(logN), is union-by-height

Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)



Viva Questions:

- can Min heap can be used to implement selection sort?
- What is hashmap in data structure?
- What is the requirement for an object to be used as key or value in HashMap?
- What is the complexity of Insertion operations in Binomial queues and Priority queues
- Whn does Binomial queues preferred over priority queus
- What is a priority queue? What are the applications for priority queue?
- Compare different implementations of priority queue
- What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.
- Define Red-Black Tree and its applications

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:		5 0			A	0	5	
	YEAR	SEMESTER			Programme			DURATION	
Degree: B. TECH (PVP20)	II]	II		B.Tech - CSE			3 HOURS
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES Internal La								

Examination

	LAB	
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
Instructions:		SET:
 Aim, Short Description/Procedure (1.5 M statement has to be written for the below 	Marks), Program/Task Steps and Result (1.5 Marks)	
	ts describing each section of it. If scenario, describe	37
• There shall be no change in program.		
 Kindly Answer the Viva Voce Question 	s in the script for evaluation. (2 Marks)	_

Let's say there are 5 people A, B, C, D E. A is a friend of B, B is a friend of C and D is a friend of E. As we can see:

- 1) A, B and C are connected to each other.
- 2) D and E are connected to each other.

use appropriate Data Structure to check whether one friend is connected to another in a direct or indirect way or not.

And the implementation, guarantees that all the trees will have depth at most O(logN), is union-by-height

Viva Questions:

- can Min heap can be used to implement selection sort?
- What is hashmap in data structure?
- What is the requirement for an object to be used as key or value in HashMap?
- What is the complexity of Insertion operations in Binomial queues and Priority queues
- Whn does Binomial queues preferred over priority queus
- What is a priority queue? What are the applications for priority queue?
- Compare different implementations of priority queue
- What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?

LAB

- What is a B-tree data structure? What are the applications.
- Define Red-Black Tree and its applications

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:	5 0	A 0	5
TECHNOLOGY	YEAR	SEMESTER	Programme	DURATION
Degree: B. TECH (PVP20)	II	П	B.Tech - CSE	3 HOURS
Course Code: 20CS3552	SUBJECT: AD	CTURES	Internal Lab Examination	

DEPARTMENT: CSE DATE OF EXAM: 09-05-2023		AC Year: 2022-23
statement has to be written for the below	arameters.	SET: 33

Let's say there are 5 people A, B, C, D E. A is a friend of B, B is a friend of C and D is a friend of E. As we can see:

- 1) A, B and C are connected to each other.
- 2) D and E are connected to each other.

use appropriate Data Structure to check whether one friend is connected to another in a direct or indirect way or not and that a sequence of M operations requires O(M) average time if union-by-size is used

Viva Questions:

- can Min heap can be used to implement selection sort?
- What is hashmap in data structure?
- What is the requirement for an object to be used as key or value in HashMap?
- What is the complexity of Insertion operations in Binomial queues and Priority queues
- Whn does Binomial queues preferred over priority queus
- What is a priority queue? What are the applications for priority queue?
- Compare different implementations of priority queue
- What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?

LAB

- What is a B-tree data structure? What are the applications.
- Define Red-Black Tree and its applications

P. V. P. SIDDHARTHA INSTITUTE OF	Regd. No:	5 0	A 0	5		
TECHNOLOGY	YEAR	SEMESTER	Programme	DURATION		
Degree: B. TECH (PVP20)	II	II	B.Tech - CSE	3 HOURS		
Course Code: 20CS3552	SUBJECT: AD	CTURES	nternal Lab			

DEPA	ARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
Instruc	etions:		SET:
•	statement has to be written for the below	s describing each section of it. If scenario, describe arameters.	34

Choose an appropriate algorithm which can be used to **efficiently to** calculate single source shortest paths in a Directed Acyclic Graph?

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?

P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:			5	0		A	0	5			
	YEAR	SEMESTER			Programme			DURATION				
Degree: B. TECH (PVP20)	II	II				B.Tech - CSE				3 HOURS		
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB								Internal Lab Examination			
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023							\mathbf{A}	C Year: 2022-23			

Instructions:

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

SET:

35

Program/Task:

Choose an appropriate algorithm which can be used to **efficiently to** calculate single source shortest paths in a Directed Acyclic Graph?

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?

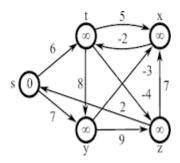
P. V. P. SIDDHARTHA INSTITUTE OF TECHNOLOGY	Regd. No:			5	0		A	0	5			
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Degree: B. TECH (PVP20)	II		II				B.Tech - CSE			3 HOURS		
Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB							_	Internal Lab Examination			
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023						A	AC Year: 2022-23				
Instructions:									s	ET:		

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

36

Program/Task:

Choose an appropriate algorithm which can be used to **efficiently to** calculate single source shortest paths in a Directed Acyclic Graph?



- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
- which of the data structures is best for searching words in dictionaries?
- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- , and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.
- Define Red-Black Tree and its applications

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Course Code: 20CS3552	SUBJECT: AD LAB	-	Internal Lab Examination								
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023							AC Year: 2022-23			
Instructions:						SET:					
• Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks)											

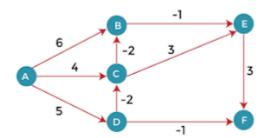
statement has to be written for the below question.

- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

37

Program/Task:

Choose an appropriate algorithm which can be used to **efficiently to** calculate single source shortest paths in a Directed Acyclic Graph?



- can Min heap can be used to implement selection sort?
- What is hashmap in data structure?
- What is the requirement for an object to be used as key or value in HashMap?
- What is the complexity of Insertion operations in Binomial queues and Priority queues
- Whn does Binomial queues preferred over priority queus
- What is a priority queue? What are the applications for priority queue?
- Compare different implementations of priority queue
- What is AVL tree data structure, its operations, and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.
- Define Red-Black Tree and its applications

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statement has to be written for the below question.

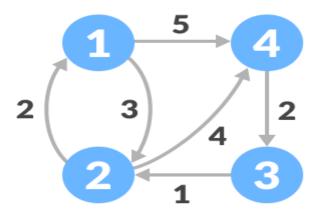
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

38

Examination

Program/Task:

The problem is to find the shortest distances between every pair of vertices in a given edgeweighted directed Graph. Choose an appropriate algorithm to find the solution



Viva Questions:

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
- How can memory be saved when storing color information in a Red-Black tree?
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- How do you check if a given binary tree is a subtree of another binary tree?
- How do you find if two trees are identical?
- , and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.

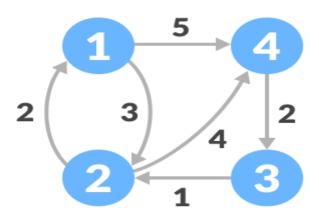
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LAB

DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023	AC Year: 2022-23
statement has to be written for the below	ats describing each section of it. If scenario, describe parameters.	39

Program/Task:

The problem is to find the shortest distances between every pair of vertices in a given edgeweighted directed Graph. Choose an appropriate algorithm to find the solution



- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
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- How do you find if two trees are identical?
- , and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.

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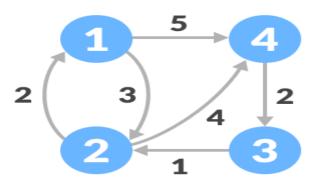
- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

SET:

40

Program/Task:

The problem is to find the shortest distances between every pair of vertices in a given edgeweighted directed Graph. Choose an appropriate algorithm to find the solution



- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

SET:

41

Examination

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques.

Text: AABAACAADAABAABA

Pattern: A A B A

Pattern Found at 0, 9 and 12

Viva Questions:

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
- What is topological sorting in a graph?
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- , and its rotations? What are the applications for AVL trees?
- What is a B-tree data structure? What are the applications.

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Course Code: 20CS3552	SUBJECT: AD	VANCED DATA STRUCTURES								nal Lab	

LAB

Instructions:

• Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.

• Write the Program legibly with comments describing each section of it. If scenario, describe

• There shall be no change in program.

each and every step with configuration parameters.

• Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

42

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques.

Text: AABAACAADAABAABA

Pattern: A A B A

Pattern Found at 0, 9 and 12

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
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- Write a program to remove duplicates from a sorted array in place?
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
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SET:

43

AC Year: 2022-23

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques.

Text: AABAACAADAABAABA

Pattern: A A B A

Pattern Found at 0, 9 and 12

Viva Questions:

DEPARTMENT: CSE

- What is a B-tree data structure? What are the applications for B-trees?
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Degree: B. TECH (PVP20)	II	П	B.Tech -	CSE	3 HOURS
Course Code: 20CS3552	SUBJECT: AD LAB	VANCED DATA STRU	CTURES	_	nternal Lab Examination

DATE OF EXAM: 09-05-2023

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
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SET:

44

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques.

Text: AABAACAADAABAABA

Pattern: A A B A

Pattern Found at 0, 9 and 12

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
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- What is a B-tree data structure? What are the applications.

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Course Code: 20CS3552	SUBJECT: AD LAB	VANCED I	RES	_		nal La	_						
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023												
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques.

Text: AABAACAADAABAABA

Pattern: A A B A



Pattern Found at 0, 9 and 12

- What is a B-tree data structure? What are the applications for B-trees?
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques. With its Time Complexity = O(m* (n-m))

Text: AABAACAADAABAABA

Pattern: A A B A



Pattern Found at 0, 9 and 12

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
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- , and its rotations? What are the applications for AVL trees?
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Degree: B. TECH (PVP20)	II			II	Tech	- CSE	SE 3 HOURS						
Course Code: 20CS3552	SUBJECT: AD LAB	SUBJECT: ADVANCED DATA STRUCTURES LAB											
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023				DATE OF EXAM: 09-05-2023								
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques. The average and best-case running time is O(n+m), and with its worst-case time is O(nm)

Input: txt[] = "THIS IS A TEST TEXT", pat[] = "TEST"

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
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- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

Program/Task:

Develop a solution to search for a pattern string using String Search Techniques. with the total time complexity of the approach is O(N + M).

Text: AABAACAADAABAABA

Pattern: A A B A



Pattern Found at 0, 9 and 12

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
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Course Code: 20CS3552	SUBJECT: ADVANCED DATA STRUCTURES LAB								Internal Lab Examination			
DEPARTMENT: CSE	DATE OF EXAM: 09-05-2023								AC Year: 2022-23			

- Aim, Short Description/Procedure (1.5 Marks), Program/Task Steps and Result (1.5 Marks) statement has to be written for the below question.
- Write the Program legibly with comments describing each section of it. If scenario, describe each and every step with configuration parameters.
- There shall be no change in program.
- Kindly Answer the Viva Voce Questions in the script for evaluation. (2 Marks)

SET:

49

Program/Task:

Given a string 'str' and a pattern 'pat', you have to find all occurrences of the pattern in the string. You have to print the starting positions of all occurrences of the pattern in the string. Develop an algorithm with the total time complexity of the approach is O(N + M).

Example -

Input:

'str' = "heyhihey" 'pat' = "hey"

- What is a B-tree data structure? What are the applications for B-trees?
- Define Red-Black Tree and its applications
- Which data structures are used for implementing LRU cache?
- Write a program to remove duplicates from a sorted array in place?
- Write a function to merge two sorted binary search tree
- Write a recursive function to calculate the height of a binary tree \
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