56 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baisakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Data Structure and Algorithm *(CT552)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define ADT and construct ADT of Linked List using value definition and operator definition. [2+4]
2. Define stack. How to convert infix to postfix notation? Explain with example. Evaluate the postfix expression AB+C*DEFG-*+with status of stack where A = 2, B = 3, C = 10, D = 5, E = 2, F = 4 and G = 6. [2+4+4]
3. Explain array representation of list? How does it differ from dynamic list? [4+2]
4. Write algorithms of implementation of stock and queue using singly linked list. [10]
5. How recursive algorithm uses STACK to store intermediate results, illustrate with an example? Distinguish between normal function and recursive function. [5+3]
6. Explain deletion of node with one child in BST with suitable example. Construct a B-tree of order 5 for following data: 82, 12, 22, 23, 56, 96, 37, 99, 59, 74, 28, 65, 60 and 44. [5+5]
7. Explain shell sort. Sort the numbers 92, 83, 22, 49, 36, 98, 12, 9, 70 and 51 using shell sort. [4+4]
8. Compare sequential search with binary search. Discuss about linear probing and quadratic probing. [5+5]
9. Describe the importance of growth function in algorithm. Discuss about theta function, Big-Oh function and Omega function. [2+4]
10. Write an algorithm for Warshall's algorithm and illustrate with an example. [6]

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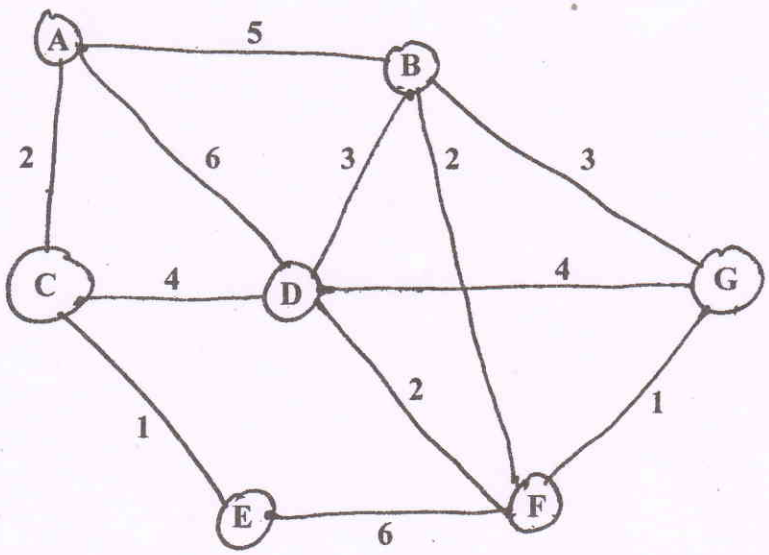
56 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Data Structure and Algorithm *(CT552)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define data structure with its importance. [4]
2. Convert A + B - C * (D - E + F/G) / H expression into postfix expression using stack. [10]
3. Define queue. Explain enqueue and dequeue operation with example. [1+4]
4. Write algorithms of insertion and deletion of data in array implementation of lists. [6]
5. How do you delete a node at the end of the doubly linked list? Explain how the addition of polynomial equations is done using linked list. [5+5]
6. What is tree recursion? Write an algorithm for TOH with 'n' disks and generate a recursion tree of TOH problem with 3 disks. [1+3+4]
7. Discuss about AVL rotations with suitable examples. Create a AVL balanced tree for data sequence 10 20 30 50 45 40 8 5 3. [6+6]
8. Explain selection sort. Sort data sequence 40 90 20 -10 30 5 60 100 80 using selection sort method. [10]
9. Define big-O notation and Big-Ω notation with their respective curves. [5]
10. Explain Depth first traversal in graph. Create minimum spanning tree for the following graph using Kruskal's algorithm. [4+6]



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56 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Data Structure and Algorithm *(CT552)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Differentiate between primitive and non-primitive data structure. [4]
2. Explain how a circular queue differ from linear queue with suitable example. Show status of stack while converting following infix expression to postfix expression: A+B-(C*D/E+F)-G*H. [5+5]
3. Differentiate between a static and dynamic list structure and write an algorithm forgetnode () and freenode () of static list structure. [2+2+2]
4. How do you perform a push and pop operation in stack as a linked list? How do you insert and delete a node at the k^{th} position of the doubly linked list. [5+5]
5. Explain how a recursive algorithm uses stack with suitable illustrative stack diagram. [8]
6. Draw a binary Tree: [6]

   Preorder F A E K C D H G B
   In order E A C K F H D B G
7. Prove that strictly binary tree with a n leaves contain 2n-1 nodes. [6]
8. Provide best case, average case and worst case for following algorithms in Big-Oh: bubble sort, insertion sort, merge sort and selection sort. Construction heap sort for following given list with an algorithm: 37, 33, 26, 92, 57, 18, 48, 25, 12, 86, 42, 22. [2+6]
9. Explain a binary search with example. Consider a hash table of size 10. Using linear probing, insert the keys 62, 37, 36, 44, 67, 91, 82 and 107. [3+5]
10. Define Omega and theata notation with suitable example. [4]
11. Write an algorithm for warshall's algorithm with suitable example. Define Breadth first traversal and depth first traversal with an example. Define Kruskal's Algorithm with suitable example. [3+3+4]

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56 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Ashwin

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Data Structure and Algorithm *(CT552)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define a data structure? Explain the basic data structure operations. [4]
2. What is a stack? Write an algorithm to convert infix expression into postfix expression using stack. [1+4]
3. Define a queue. Explain enqueue and dequeue operation in circuit queue. [1+4]
4. Differentiate static and dynamic implementation of list with suitable example. [6]
5. Define different types of linked list with suitable example. [5]
6. Write an algorithm creates a single linked list. [5]
7. Do you think recursive function is slow? Compare recursive and non-recursive functions. Draw recursion tree for Tower of Hanoi assuming 4 disks. [1+2+5]
8. Create an AVL balanced tree for the set of data 10, 20, 30, 35, 50, 70, 40, 80, 60, 65 by explaining each rotation rules used. [6]
9. Construct B-tree of order 5 for the set of data C N G A H E K Q M F W L T Z D P R X Y S showing each steps. [6]
10. Define a radix sort with its algorithm. Trace the steps to sort the following set of data using merge sort: 85, 76, 46, 92, 30, 41 and 12. [5+3]
11. How a linear probing, quadratic probing and double hashing techniques are used to resolve collision? Explain with suitable example. [8]
12. Define an Omega and Theta notation with suitable example. [4]
13. Explain a breadth first traversal in graph with suitable example. Explain Kruskal's algorithm to find minimum spanning tree with suitable example. [5+5]

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46 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Data Structure and Algorithm

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Why data structures are needed? Write any data structure as ADT and write applications of stacks. [2+3+1]
2. Convert the following expression to postfix and prefix: [2+2]

   ((A+B)*C-(D-E))$(F+G)
3. Can you always insert an item into an empty queue? Explain with possible reasons and example? Explain the advantages of dynamic implementation of stack and queue over sequential storage to represent stack and queue. [3+2]
4. Write an algorithm to move one node to another place after a node in singly linear linked list. [6]
5. Explain recursion with its disadvantages? Draw the recursive tree diagram for the fibonacci sequence :fib(5). [1+1+3]
6. How can you compare either two sorting or two searching algorithms? Insert the following sequence of data into an AVL tree. [1+5]

   89, 35, 15, 87, 67, 76, 37, 14, 22, 25
7. Create the heap structure from the following sequence data: [11]

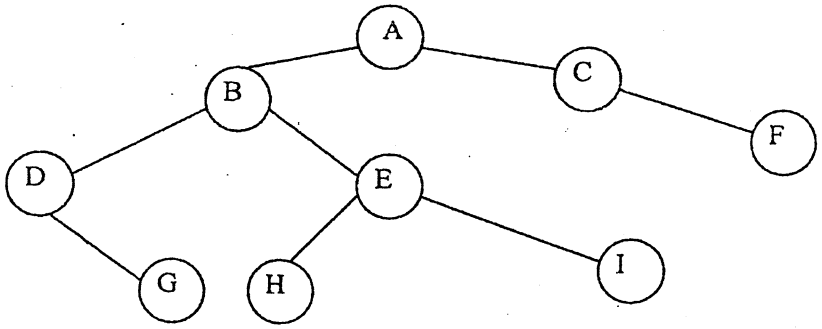
   12, 10, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13 and 2 into an empty heap.

   And sort them using heap sort.
8. Why tree balancing is required? Insert the following keys to a 5-way B-tree: [1+7]

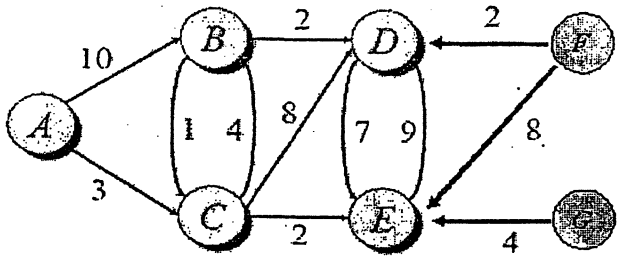
   3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 4, 19, 8, 31, 35, 10, 13, 12
9. What is clustering? Explain any three collision resolving scheme with example if applicable. What are the differences between hashing and binary tree search? [2+6+2]
10. Explain the basic principle of quick sort and write down its partition algorithm. Compare quick sort and merge sort. Trace the sorting steps in radix sort algorithm for the following data: [3+2+5]

    12, 11, 30, 21, 25, 39, 36, 17, 29, 10, 26, 33, 7, 9

11. Write down the preorder, inorder and postorder traversal of the tree shown in the figure below. [3]



12. What are the implementation differences between round robin and Kruskal's algorithms? Use Dijkstra's algorithm to find the shortest path from node A to other nodes given in the graph. [1+5]



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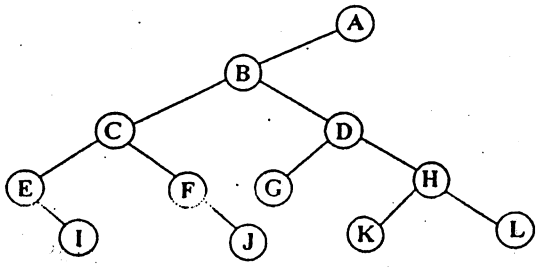
46 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Jestha

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Data Structures and Algorithms

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Write an algorithm for converting infix expression to postfix expression. Convert a given infix expression: A + (B * C – (D / E – F) * G) * H into postfix expression showing stack status after every step in tabular form. [4+4]
2. What are the demerits of simple linear queue? Write an algorithm to insert and remove data items for circular queue with the condition for queue full and empty. Trace your algorithm with an example. [2+4+2]
3. What are the types of linked list? Discuss the consideration that has to be taken while developing algorithm/program with a linked list. Why alias variables are dangerous in a linked list? Write an algorithm to delete the first node in a singly linked list. [1+4+1+2]
4. What are the types of recursion? Write an algorithm for Tower of Hanoi (TOH) and illustrate an algorithm for 3 disks. [2+2+4]
5. Define AVL balance tree and create AVL tree using AVL balancing algorithm for given sequence of data 3, 15, 21, 2, 7, 5, 13, 10, 8, 4, 19, 24, 1. Show inorder traversal of tree after each rotation clearly. [2+6]
6. Define a complete binary tree with an example. Write an algorithm for insertion of a node in binary tree. Write the sequence of node in preorder, inorder and postorder traversal for a given tree. [2+3+3]



7. Define internal and external sorting. Write an algorithm for quick sort and trace your algorithm for a given sequence of data. 5, 43, 99, 20, 45, 7, 6, 63, 92, 4. [1+4+3]
8. Define Big 'O' notation and describe the rules to determine the order of common functions. Compare linear, quadratic, logarithmic, linear logarithmic order functions. Compare the sequential search and binary search in terms of Big 'O' notation with an example. [1+3+2+2]
9. Define in-degree and out-degree in directed graph. Discuss the Depth First Traversal (DFT) and Breadth-First Traversal (BFT) with suitable examples. [2+6]
10. Write short notes on: [2×4]
    a) Almost Complete Binary Tree
    b) Transitive Closure Graph

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46 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Shrawan

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Data Structure and Algorithm

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What do you mean by abstract data type? Write an algorithm for enque and dequeue operations in a queue. [2+3+3]
2. Define stack as an ADT? Convert the following infix expression onto prefix and post fix. [2+3+3]
   a) A + [B + C + (D + E) * F] / G
   b) ((a + b) * c – (d – e) $ (f + g)
3. What are linked list? Write an algorithm for inserting a node before a node and deleting a node after a node in singly linked list. [2+3+3]
4. "A junction or a object calls itself", Explain this statement using the idea behind it. Give recursive algorithm for Fibonacci series and TOH (tower of honoi). [3+2+3]
5. Give the recursive searching algorithm for BST (Binary Search Tree). Create AVL tree using following data sets. [4+4]

   14, 12, 20, 18, 23, 4, 44, 64, 66

   Show all the steps including rotation where ever needed clearly.
6. Define B-tree. Explain deletion process in B-tree using approximate examples and also discuss the efficiency of multi-waytree. [2+4+2]
7. What is internal and external sorting? Write an algorithm for shell sort. [2+6]
8. What is collision? Explain any two methods of collision resolution with reference to hashing. [1+7]
9. Define directed undirected graph, spanning forest, minimum spanning trees. [2+3+3]
10. Explain Dijkstra's algorithm for finding sortest path with the help of an algorithm. [8]

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Examination Control Division

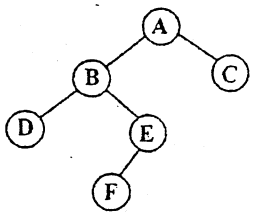
2064 Jestha

Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

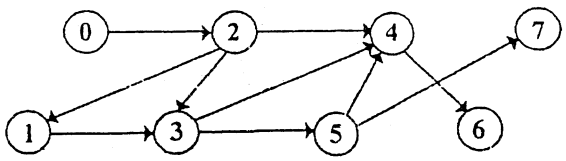
Subject: - Data Structures and Algorithms

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define stack as an ADT. Write an algorithm for evaluating postfix expression. Evaluate a given postfix expression: 4 6 4 + * 8 / 4 - in tabular form showing stack after every step. [2+3+3]
2. What are the applications of queue? Write an algorithm for linear queue where both the head and tail pointer vary. Trace your algorithm with an example. [2+4+2]
3. Discuss the merits and demerits of contiguous list and linked list. Write algorithms to insert and delete a node after a node in a singly linked list. [3+5]
4. What is mean by recursion tree? Write recursive and iterative algorithms for Fibonacci number and compare and contrast the efficiency of two algorithms. Can every recursive problem be solved iteratively? [2+5+1]
5. Define B-tree and construct the B-tree for order 5 (i.e. M = 5) for given sequence of data 1,7,6,2,11,4,8,13,10,5,19,9,18,24,3,12,14,20,21,16 showing each steps. [2+6]
6. What are the types of rotations used in balancing an AVL tree? Discuss the rules for deciding which type of rotation to use to restore the balance in AVL tree. For a given binary tree, construct an AVL tree showing its inorder traversal after every step. [2+2+4]



7. What are the conflicting efficiency considerations in various sorting methods? Compare and contrast the efficiency of Bubble sort, Quick sort, Insertion sort and Selection sort algorithms with an example. [2+6]
8. Define hashing and hash collision. How do you minimize the hash collision? Write an algorithm for collision resolution by open addressing. [2+2+4]
9. Describe a strongly and weakly connected graph with suitable examples. Write algorithms for Depth-First and Breath-First topological sorting and trace your algorithms for a given acyclic directed graph. [3+5]



10. Write short notes on: [2×4]
    a) Big 'O' notation
    b) Minimum cost spanning trees

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46 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2063 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Data Structure and Algorithm

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is circular queue? Write an algorithm to implement circular queue with the condition for the queue full and empty. [2+4+2]
2. Write the merits and demerits of contiguous list and linked list. Discuss the implementation of stack array. [4+4]
3. Write recursive algorithm to convert prefix expression to post fix expression. Draw recursion tree and transform the following prefix expression to postfix. [3+5]
   a) +-$ABC*D**EFG
   b) ++A-*$BCD/+EF*GH
4. Discuss the application of multiway search tree. Define B-tree. Using the insertion algorithm of B tree. Create 3-order B tree for the given sequence of date. [3+2+3]

   8,14,2,15,3,1,12,6,5
5. Write an algorithm to search a record in a binary search tree. If you want to search in the unsorted record in linear date structure, which searching algorithm will you choose? Discuss. [3+5]
6. What is doubly linked list and what are its features? Write the algorithms to delete a particular node in singly linked list. [1+1+6]
7. What do you mean by shortest path? Write the Dijkstra's algorithm and explain the algorithm with suitable example. [2+3+3]
8. Explain the basic principle of radix sort. Trace the sorting steps in quick sort and radix sort. [3+5]

   25,57,48,37,12,92,86,33
9. Define heap structure. Construct heap for these elements 2,8,6,1,10,15,3,12,11. Show the steps clearly. [3+5]
10. How the depth first search algorithm and breadth first search algorithm are implemented? Explain with suitable example. [4+4]

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46/2-6 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Baishakh

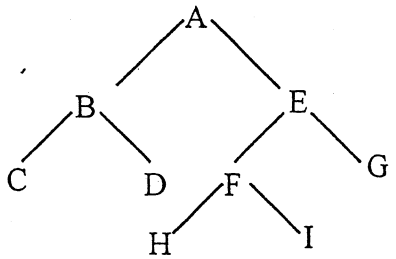
Exam.	Regular/Back		
Level	B.E.	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Data Structure and Algorithm

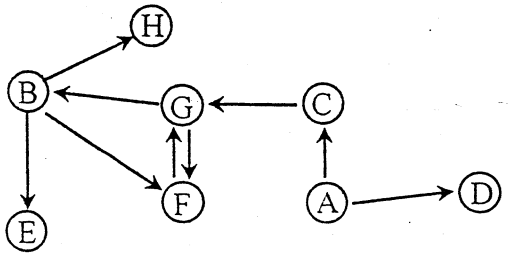
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Write an algorithm to delete a node before a node in singly and doubly linked list. [8]
2. a) Define abstract data type. Write the algorithm of enque and deque operations in circular queue. [1+3]
   b) Convert the following infix expression into prefix and postfix expression. [4]
      i) a $ b * c – d + e / f / (g + h)
      ii) ((a + b) * c – (d – e)) $ (f + g)
3. Discuss the efficiency of recursion. Draw the recursion tree for tower of Hanoi problem for 5 disks. Show execution path according to TOH algorithm. [3+5]
4. Define AVL balance tree.

   Is the given tree in figure is strictly binary tree? Give reason. What is the depth of the given tree? Write the sequences of node in preorder, postorder and inorder traversal. [2+2+1+3]



5. Define B-tree. Create AVL tree using AVL balancing algorithm for the given sequence of data. 14, 12, 8, 18, 20, 23, 44, 52. Show the steps of balancing clearly. [2+6]
6. Write the algorithm of the quick sort including the steps of partition. Discuss the complexity of this algorithm. [5+3]
7. Define Big 'O' notation. Compare linear logarithmic, linear and quadratic order function. Explain which elementary sorting algorithm (i.e. Bubble, Insertion, Selection) you choose when the input data is in almost sorted form. [2+3+3]
8. Write an algorithm of depth first topological sorting. Create spanning tree using depth first traversal method of given graph. Show the steps clearly. [4+4]



9. Define clustering in rehashing method. Is it possible to remove clustering by quadratic probing? Explain. Outline an algorithm to delete a key from a hash table when the linear probing is used for inserting keys. [3+2+3]
10. Write an algorithm for the searching in multiway search tree. [8]

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