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Question Paper Code: ACSB03

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

Dundigal, Hyderabad - 500 043

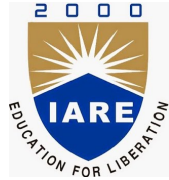
MODEL QUESTION PAPER-II

B.Tech III Semester End Examinations, November 2020

Regulations: IARE - R18

DATA STRUCTURES

(COMMON TO ME/CSE/IT/ECE/CE)



Time: 3 hour

Maximum Marks: 70

Answer ONE Question from each MODULE

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE-I

- (a) Explain the following two comparison sort algorithms with an example and write their time complexities? [7m]

 - Bubble sort
 - Selection sort
- (b) Write the name of the sorting technique which is used in playing cards game? Write a procedure for sorting a given list of numbers using that technique? 14, 25, 36, 74, 85, 6, 53, 62, 41 [7m]
- (a) Explain merge sort procedure for the given list of elements and also write its time complexity? 33, 14, 25, 45, 62, 85, 77, 65, 40, 22, 94 [7m]

(b) Explain Binary Search procedure for the following list of elements and assume the key element is 49. List: 12, 23, 34, 45, 55, 62, 71, 85, 96 [7m]

MODULE-II

- (a) Evaluate the following postfix expression using stack: [7m]

 - $9\ 3\ 4\ * \ 8\ + \ 4\ / \ -$
 - $5\ 6\ 2\ + \ * \ 1\ 2\ 4\ / \ - \ +$
- (b) Define a double ended queue (*DEQUE*). Explain input restricted and output restricted (*DEQUE*). Write an algorithm of input restricted *DEQUE*? [7m]
- (a) What is the advantage of postfix expression over infix expression? Write an algorithm of postfix expression evaluation?s [7m]

(b) Write an algorithm for evaluation of postfix expression and evaluate the following expression showing every status of stack in tabular form. [7m]

5 6 2 - * 4 9 3 / + *

MODULE-III

5. (a) Write an algorithm/program to implement following operations in the Singly Linked list?
 (i) Insert the node at end
 (ii) Delete the node whose value = Y. [7m]
- (b) Write advantages and disadvantages of linked list, doubly linked list and circular linked list with example. [7m]
6. (a) What are the advantages of doubly linked list? Write a function to find maximum element from doubly linked list. [7m]
- (b) Write an algorithm to insert a node before a given node in a singly linked list. Is it advantageous to use a doubly linked list for this operation? Explain [7m]

MODULE-IV

7. (a) Briefly explain advantages of binary search tree. Construct binary search tree for the following elements *8, 3, 11, 5, 9, 12, 13, 4, 6, 20*. [7m]
- (b) The in-order and preorder traversal of a binary tree are
 (i) Pre-Order Traversal: *a b d e c f g*
 (ii) In-Order Traversal: *d b e a f c g*
 respectively. Construct binary tree and find its post-order traversal. [7m]
8. (a) Create a B-tree of order 5 by inserting the following data values. *D, H, K, Z, B, P, Q, E, A, S, W, T, C, L, N, Y, M* [7m]
- (b) Define Directed graph, spanning tree and minimum spanning tree. Find minimum spanning tree for the graph shown in **fig 1** [7m]

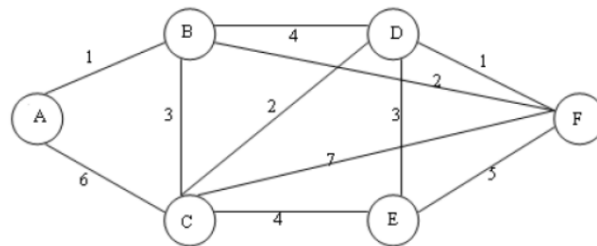


Figure 1: 8B

MODULE-V

9. (a) Create a Binary Search Tree for the following data and do In-order, Preorder and Post-order traversal of the tree.
50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5 [7m]
- (b) The keys *12, 18, 13, 2, 3, 23, 5 and 15* are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \text{ mod } 10$ and linear probing. What is the resultant hash table? [7m]

10. (a) What do you mean by hashing? What are the various hash functions? Explain each one in brief. [7m]
- (b) Define AVL tree. Construct AVL tree for following data *10,20,30,40,50,60,70,80*
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****END OF EXAMINATION****

COURSE OBJECTIVES:

The course should enable the students to:

1	To provide students with skills needed to understand and analyze performance trade-offs of different algorithms/implementations and asymptotic analysis of their running time and memory usage.
2	To provide knowledge of basic abstract data types (ADT) and associated algorithms: stacks, queues, lists, tree, graphs, hashing and sorting, selection and searching.
3	The fundamentals of how to store, retrieve, and process data efficiently.
4	To provide practice by specifying and implementing these data structures and algorithms in Python.
5	Understand essential for future programming and software engineering courses.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

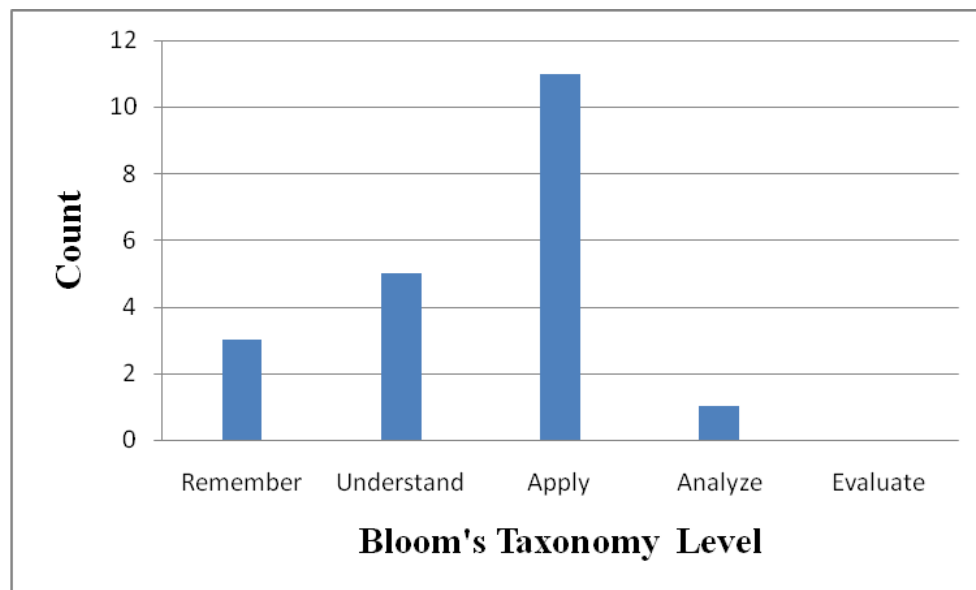
CO 1	Carryout the analysis of a range of algorithms in terms of algorithm analysis and express algorithm complexity using the O notation.
CO 2	Make use of recursive algorithm design technique in appropriate contexts.
CO 3	Represent standard ADTs by means of appropriate data structures.
CO 4	Select appropriate sorting technique for given problem.
CO 5	Select appropriate searching technique for given problem.
CO 6	Implement standard searching and sorting algorithms; including binary search; merge sort and quick sort; and their complexities.
CO 7	Design and implement linked lists, stacks and queues in Python.
CO 8	Explain the use of basic data structures such as arrays, stacks, queues and linked lists in program design.
CO 9	Extend their knowledge of data structures to more sophisticated data structures to solve problems involving balanced binary search trees, AVL Trees, B-trees and B+ trees, hashing, and basic graphs.
CO 10	Design and implement tree structures in Python.
CO 11	Compare and contrast the benefits of dynamic and static data structures implementations and choose appropriate data structure for specified problem domain.
CO 12	Quickly determine and explain how efficient an algorithm or data structure will be, apply appropriate data structures for solving computing problems with respect to performance.

MAPPING OF SEMESTER END EXAMINATION QUESTIONS TO COURSE OUTCOMES

Q.No		All Questions carry equal marks	Taxonomy	CO's	PO's
1	a	Explain the following two comparison sort algorithms with an example and write their time complexities? 1. Bubble sort 2. Selection sort	Apply	CO 4,6,12	PO 1
	b	Write the name of the sorting technique which is used in playing cards game? Write a procedure for sorting a given list of numbers using that technique? 14, 25, 36, 74, 85, 6, 53, 62, 41	Apply	CO 4,6,12	PO 1
2	a	Explain merge sort procedure for the given list of elements and also write its time complexity? 33, 14, 25, 45, 62, 85, 77, 65, 40, 22, 94	Analyze	CO 1	PO 1
	b	Explain Binary Search procedure for the following list of elements and assume the key element is 49. List: 12, 23, 34, 45, 55, 62, 71, 85, 96	Apply	CO 4,5,12	PO 1
3	a	Evaluate the following postfix expression using stack: (i) 9 3 4 * 8 + 4 / - (ii) 5 6 2 + * 1 2 4 / - +	Understand	CO 7,8,11,12	PO 1,2,3
	b	Define a double ended queue (<i>DEQUE</i>). Explain input restricted and output restricted (<i>DEQUE</i>). Write an algorithm of input restricted <i>DEQUE</i> ?	Apply	CO 7,8,11,12	PO 1,2,3
4	a	What is the advantage of postfix expression over infix expression? Write an algorithm of postfix expression evaluation?	Apply	CO 7,8,11,12	PO 1,2,3
	b	Write an algorithm for evaluation of postfix expression and evaluate the following expression showing every status of stack in tabular form. 5 6 2 - * 4 9 3 / + *	Apply	CO 7,8,11,12	PO 1,2,3
5	a	Write an algorithm/program to implement following operations in the Singly Linked list? (i) Insert the node at end (ii) Delete the node whose value = Y..	Analyze	CO 7,8,11,12	PO 1,2,3
	b	Write advantages and disadvantages of linked list, doubly linked list and circular linked list with example.	Analyze	CO 7,8,11,12	PO 1,2,3
6	a	What are the advantages of doubly linked list? Write a function to find maximum element from doubly linked list.	Understand	CO 7	PO 1

	b	Write an algorithm to insert a node before a given node in a singly linked list. Is it advantageous to use a doubly linked list for this operation? Explain	Apply	CO 7,8,11,12	PO 1,2,3
7	a	Briefly explain advantages of binary search tree. Construct binary search tree for the following elements <i>8,3,11,5,9,12,13,4,6,20</i> .	Understand	CO 9,12	PO 1,2,3
	b	The in-order and preorder traversal of a binary tree are (i) Pre-Order Traversal: <i>a b d e c f g</i> (ii) In-Order Traversal: <i>d b e a f c g</i> respectively. Construct binary tree and find its post-order traversal.	Apply	CO 8,9,10,11	PO 1,2,3
8	a	Create a B-tree of order 5 by inserting the following data values. <i>D, H, K, Z, B, P, Q, E, A, S, W, T, C, L, N, Y, M</i>	Apply	CO 7,8,11,12	PO 1,2,3
	b	Define Directed graph, spanning tree and minimum spanning tree. Find minimum spanning tree for the graph shown in fig 1	Apply	CO 7,8,11,12	PO 1,2,3
9	a	Create a Binary Search Tree for the following data and do In-order, Preorder and Post-order traversal of the tree. <i>50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5</i>	Understand	CO 7,8,11,12	PO 1,2,3
	b	The keys <i>12, 18, 13, 2, 3, 23, 5 and 15</i> are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \text{ mod } 10$ and linear probing. What is the resultant hash table?	Understand	CO 7,8,11,12	PO 1,2,3
10	a	What do you mean by hashing? What are the various hash functions? Explain each one in brief..	Understand	CO 7,8,11,12	PO 1,2,3
	b	Define AVL tree. Construct AVL tree for following data <i>10,20,30,40,50,60,70,80</i>	Analyze	CO 7,8,11,12	PO 1,2

KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator
Ms. B Padmaja, Assistant Professor, CSE

HOD, ME