

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
Software Engineering
1st Year 2nd Semester Final Examination' Dec 2019 (Session: 2018-19)
Course Code: SWE 127 Credits: 3 Course Title: Data Structure
Time: 3 hrs Total Marks: 100

Group A
[Answer all the questions]

1. Answer any FIVE 5x2=10
 - a) Write the complexity of Floyd Warshall algorithm.
 - ☒ b) Derive the complexity of Linear Search Algorithm.
 - c) Order the sorting algorithms (Bubble-Sort, Insertion-Sort, Selection-Sort, Merge-Sort, QuickSort) according to their complexity. Number of item = 1024.
 - ☒ d) What is overflow and underflow?
 - ☒ e) Write a C functions to modify head pointer of a Linked List?
 - ☒ f) $E = (((18 / (4 - 1)) - 2) * (3 + 2)) + 2$ Draw a binary tree with expression E and traverse it in postorder and preorder.

2. Answer any FOUR 4x5=20
 - ☒ a) What is the Worst case complexity of QuickSort? When does this happen? 5
 - ☒ b) Consider the following queue where QUEUE is allocated 6 memory cells(0-based indexing): 5
 FRONT = 1, REAR = 4, QUEUE: _____, London, Berlin, Rome, Paris, _____
 Describe the queue, including FRONT and REAR, as the following operations take place:
 - i. Athens is added
 - ii. Madrid is added
 - iii. Moscow is added
 - iv. Two cities are deleted
 - v. Oslo is added
 - vi. Six cities are deleted
 - ☒ c) Let T be a binary tree with 9 nodes. The in-order and pre-order traversal of T yields the following sequences: 5
 In-Order: E A C K F H D B G Pre-Order: F A E K C D H G B
 Draw the tree T. Show the steps.
 - d) Suppose the following list of letters is inserted in order into an empty binary search tree: K, R, E, H, U, F, N, I, B, O, L 5
 Construct the Binary Search Tree. Show all steps.
 Now Delete R from the tree and find the final tree. Show all steps.
 - e) Using Insertion sort algorithm, sort the following letters: TEACHERS. Show all steps. 5
 - ☒ f) Write down the steps to search 7 in the following integer numbers using Binary search 2, 4, 7, 8, 21, 34, 35, 56, 58, 78, 79, 83, 90, 99, 100 5

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3. Answer any TWO 2x10=20
 - a) Suppose that the following characters are given with their corresponding frequency (In Thousand): e:9 f:5 d:16 a:45 c:12 b:13 10
 Using Huffman's algorithm, find the code for each character. Compare the result of variable length code-word with fixed length code-word.
 - ☒ b) Translate the infix expression to its equivalent postfix expression using stack. Show the steps using a table. $(A - 2 * (B + C) \uparrow 3 / D * E) + F \uparrow G$ 10
 - c) Use Heap sort to sort the following array. (In ascending order) 10
 12, 23, 45, 2, 3, 4, 5, 7, 6, 24, 25, 26, 28, 30

Group B
[Answer all the questions]

5x2=10

4. Answer any FIVE

- Write short notes and give examples of Complete binary trees and Extended binary trees.
- Differentiate between a Graph and a Tree.
- Array is not a linear data structure. True or False?
- Write algorithm for Fibonacci series using recursion.
- What is binary search tree? Give a proper example.
- Why is there just one pointer variable in stack, where there are two pointer variables in queue?

4x5=20

5. Answer any FOUR

- Consider the following stack of city names (STACK is allocated N = 6 memory cells):

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STACK: London, Berlin, Rome, Paris, _____, _____

Describe the stack as the following operations take place:

- PUSH(Athens)
- POP()
- POP()
- PUSH(Madrid)
- PUSH(Moscow)
- POP()
- PUSH(Dhaka)
- PUSH(Kabul)
- PUSH(Thimphu)
- PUSH(Beijing)

- Write an algorithm to reverse a string using recursion.

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- Convert the following postfix notation to infix notation and find the value of the expression:
12 7 3 - / 2 1 5 + * +

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- Consider the following sorted linked list represented using two linear arrays INFO and NEXT.

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Start		INFO	NEXT
3	1		4
	2	13	6
	3	5	8
	4		9
Avail	5		1
5	6	19	10
	7		0
	8	9	2
	9		7
	10	23	0

Answer the following questions:

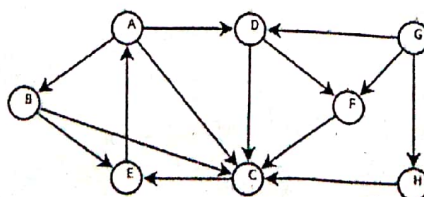
- Redraw the given figure so that it represents the sorted linked list after inserting a node containing the value 15 in the INFO field.
- Redraw the given figure so that it represents the sorted linked list after deleting the node containing the value 19 in the INFO field.

- Sort the array in ascending order using Insertion Sort: (Show each step)
77, 33, 44, 11, 88, 22, 66, 55

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- Traverse the following Graph using BFS, DFS starting from A.

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6. Answer any TWO

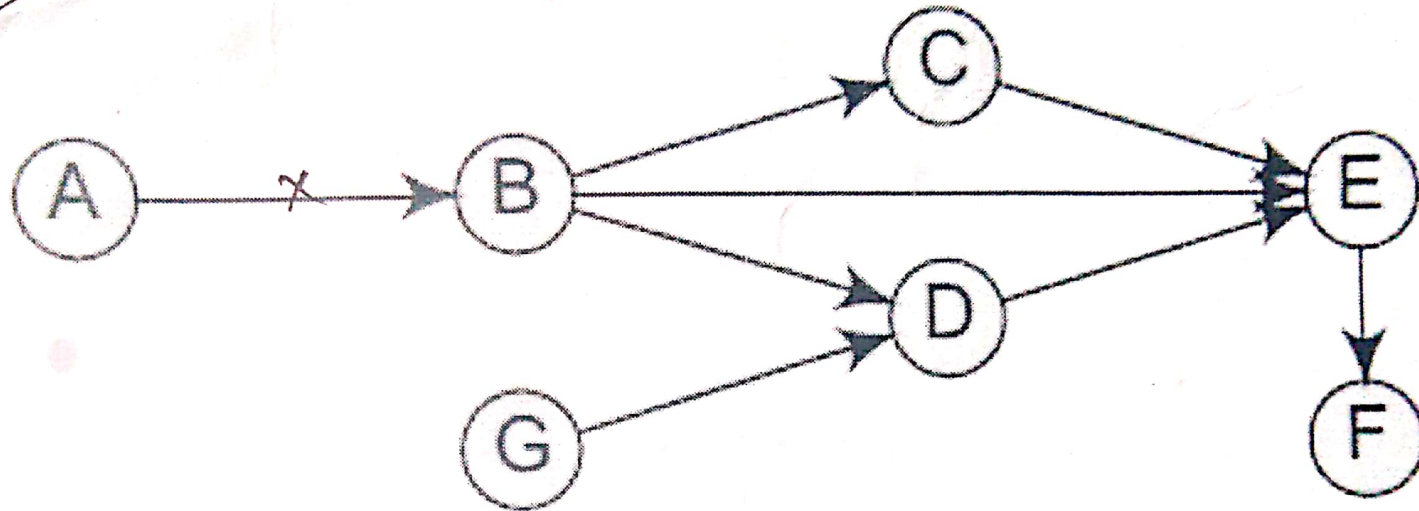
2x10=20

- Use Heap sort to sort the following array. (In ascending order)
12, 23, 45, 2, 3, 4, 5, 7, 6, 24, 25, 26, 28, 30

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b) Find a topological sort of the following graph by showing each step.

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c) Construct an AVL search tree by inserting the following elements in the order of their occurrence. 67, 4, 17, 29, 16, 113, 101, 88
Show the steps with rotations.

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