Department of Information and Communication Engineering
Pabna University of Science and Technology
Question Bank
Data Structure and Algorithm

Sl.	Question	Chapter
1.	Define algorithm. Explain the features of an efficient algorithm.	
2.	What is space complexity? With an example, explain the components of fixed and variable part in space complexity.	
3.	Explain how time complexity is calculated. Give an example.	
4.	Elaborate on asymptotic notations with examples.	
5.	Compare the order of growth of $n(n-1)/2$ and n^2.	
6.	Calculate the time complexity of $1+3+5+7+\cdots \ldots \ldots \ldots \ldots \ldots . +999$.	
7.	Give the Euclid's algorithm for computing $GCD(m,n)$.	
8.	Give the general method of Greedy algorithm. Write some applications of Greedy method.	
9.	State the general principle of greedy algorithm. What is the drawback of Greedy algorithm?	
10.	Compare feasible and optimal solution.	
11.	Differentiate between divide and conquer and greedy method.	
12.	Differentiate between greedy technique and dynamic programming.	
13.	Apply Greedy method to solve the optimal storage on tapes problem if n=3 and (I_1, I_2, I_3) = (5, 10, 3).	
14.	Explain how job sequencing with deadline can be solved using Greedy approach.	
15.		
16.	Give an algorithm for Greedy Knapsack. Consider n=7, m=20, (p1, p2, p3, p4, p5, p6, p7)=(10, 5, 15, 7, 6, 18, 2) and (w1,w2,w3,w4,w5,w6,w7)=(2,3,5,7,1,4,2). Obtain the optimal solution for this Knapsack instance.	
17.	What are differences between Prim's algorithm and Kruskal's algorithm?	
18.	Differentiate between dynamic programming and divide and conquer paradigm.	
19.	Write the general procedure of dynamic programming.	
20.	State the principle of optimality.	
21.	Write algorithm for travelling salesperson problem using dynamic programming.	
22.	Schedule two jobs on 4 machine using flow shop scheduling technique. The time required by each operation of these jobs is given by following matrix. $J=\begin{bmatrix}3 & 0\\ 0 & 3\\ 4 & 2\\ 5 & 2\end{bmatrix}$	
23.	Explain the concept of backtracking with the help of suitable example.	
24.	Solve 8-queen's problem for a feasible sequence (8, 2, 5, 3).	

Sl.	Question	Chapter
25.	State and explain Graph coloring problem? How backtracking approach is useful for assigning different colors to adjacent vertices?	
26.	Give an algorithm for finding Hamiltonian cycles using backtracking.	

Sl.	Question	Chapter
1.	What are the differences between a Stack, Queue, and Array?	
2.	Calculate the efficiency of binary search over the sequential search.	
3.	Consider the pattern $P = a^3ba$. Construct the table and the corresponding labeled directed graph used in the "fast" pattern matching algorithm.	
4.	Consider the linear arrays AAA(5:50), BBB(-5: 10) and CCC(8). (i) Find the number of elements in each array. (ii) Suppose Base(AAA) = 300 and w= 4 words per memory cell for AAA. Find the address of AAA[l5], AAA(35] and AAA[55].	
5.	Suppose A is a sorted array with 400 hundred elements, and suppose a given element x appears with the same probability in any place in A. Find the worst case running time $f(n)$ and the average case running time $g(n)$ to find x in A using the binary search algorithm.	
6.	Using the bubble sort algorithm, find the number of comparisons (C) and the number of interchanges (D) which alphabetize the n = 6 letters in PEOPLE.	
7.	Explain the process of insertion an item into a linked list in the middle.	
8.	Define terms: i) Overflow ii) Underflow and iii) Garbage Collection.	
9.	What are the differences between a tree and a binary tree? Give the representation of the binary tree and explain.	
10.	Let n denote a positive integer. Suppose a function L is defined recursively as follows $L(n) = \begin{cases} 0, & if\ n = 1 \\ L(\lfloor n/2 \rfloor + 1) & if\ n > 1 \end{cases}$ I) Find $L(25)$ II) What does this function do?	
11.	Let a and b denote positive integers. Suppose a function Q is defined recursively as follows $Q(a,b) = \begin{cases} 0, & if\ \text{a} < \text{b} \\ Q(a-b,b)+1 & if\ \text{b} \le \text{a} \end{cases}$ i) Find the value of $Q(2,3)$ and $Q(14,3)$. ii) What does this function do? Find $Q(5861,7)$	
12.	Consider the following stacks of city names: STACK: London, Berlin, Rome, Paris, _____, _____. I) Describe the stack as the following operations take place: A) PUSH(STACK, Athens) B) POP(STACK, ITEM) C) POP(STACK, ITEM) D) PUSH(STACK, Dhaka) E) PUSH(STACK, Tokyo) F) POP(STACK, ITEM) II) Describe the stack if the operation POP(STACK, ITEM) deletes London.	

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13.	Given that following list of 12 numerical data: 44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66. Use the quicksort algorithm to find the final position of the first number 44.	
14.	Write an ADT to implement a stack of size N using an array. The elements in the stack are to be integers. The operations to be supported are PUSH, POP, and DISPLAY. Take into account the exceptions of stack overflow and stack underflow.	
15.	Define a binary tree and complete binary tree with example.	
16.	A binary tree T has 9 nodes. The inorder and preorder traversals of T yield the following sequences of nodes. Draw the tree T. Inorder: E A C K F H D B G Preorder: F A E K C D H G B	
17.	Construct a 3-way search tree for the list of keys in the order shown below. What are your observations? List A: 10, 15, 20, 25, 30, 35, 40, 45 List B: 20, 35, 40, 10, 15, 25, 30, 45	
18.	Define B tree. Construct a B tree of order 3 by inserting the following keys in the order shown into an empty B tree: M Q A N P W X T G E J	
19.	Suppose the 7 data items are assigned the following weights: (A, 13), (B, 2), (C, 19), (D, 23), (E, 29), (F, 5), (G, 9). Find a 2-tree with a minimum weighted path length P. What is the Huffman coding for the 7 letters?	
20.	Apply the selection sort algorithm to sort the following elements: 77, 33, 44, 11, 88, 22, 66, 55, 99	