



BRAINWARE UNIVERSITY

Term End Examination 2023

Programme – B.Tech.(CSE)-2020

Course Name – Advanced Algorithms

Course Code - PEC-601A

(Semester VI)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) What is the time complexity of longest common subsequence problem using naive algorithm?
 - a) $O(n)$
 - b) $O(n * n^2)$
 - c) $O(n * 2n)$
 - d) $O(n^2 * 2n)$
- (ii) A stable sorting technique is defined as if
 - a) it takes $O(n \log n)$ time
 - b) it uses divide and conquer technique
 - c) relative order of occurrence of non-distinct elements is maintained
 - d) it takes $O(n)$ space
- (iii) What is the average number of comparisons required for finding the maximum and minimum element from an array of n elements using the application of divide and conquer strategy?
 - a) $T(n) = (3n/2) - 1$
 - b) $T(n) = (3n/2) - 2$
 - c) $T(n) = 2n - 1$
 - d) none of these
- (iv) Which of the following algorithms is the best approach for solving Huffman codes?
 - a) exhaustive search
 - b) greedy algorithm
 - c) brute force algorithm
 - d) dynamic programming algorithm
- (v) Time complexity for 0/1 Knapsack problem solved using DP is
 - a) $O(N)$
 - b) $O(NW)$
 - c) $O(N^2)$
 - d) None of these
- (vi) Time complexity for 0/1 Knapsack problem solved using Brute Force Technique is
 - a) $O(N^2)$
 - b) $O(N^3)$
 - c) $O(2N)$
 - d) None of these
- (vii) In what manner is a state-space tree for a backtracking algorithm constructed?
 - a) Depth-first search
 - b) Breadth-first search
 - c) twice around the tree
 - d) Nearest neighbor first
- (viii) Which of the following sorting method identified as best if number of swapping done, is the only measure of efficiency ?

- a) Bubble sort
 c) Both are same
- b) Selection sort
 d) None of these
- (ix) Which of the following problem(s) is/are an example of dynamic programming approach?
 a) 0/1 Knapsack problem
 c) All pair shortest path problem
- b) LCS problem
 d) All of these
- (x) Select the appropriate term which is used in dynamic programming?
 a) memoization
 c) memorialization
- b) memorization
 d) none of these
- (xi) Optical substructure property is associated with
 a) Greedy strategy
 c) Both (a) and (b)
- b) Dynamic programming strategy
 d) none of these
- (xii) The order of the binary search algorithm in average case is
 a) n
 c) n log n
- b) log n
 d) n/2
- (xiii) The order of the binary search algorithm in best case is
 a) n/2
 c) 1
- b) n
 d) none of these
- (xiv) The worst-case efficiency of solving a problem in polynomial time is?
 a) $O(p(n))$
 c) $O(p(n^2))$
- b) $O(p(n \log n))$
 d) $O(p(n \log n))$
- (xv) Problems that cannot be solved by any algorithm are called?
 a) tractable problems
 c) undecidable problems
- b) intractable problems
 d) decidable problems

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Write short notes of Approximation algorithm (3)
 3. Define speedup and efficiency of parallel algorithm (3)
 4. What are the two major constraints of N-queen problem? Explain. (3)
 5. A text is made up of the characters a, b, c, d, e each occurring with the probability 0.11, 0.40, 0.16, 0.09 and 0.24 respectively. Calculate the average length of the optimal Huffman coding. (3)
 6. Differentiate between NP-hard problem and NP-complete problem (3)

OR

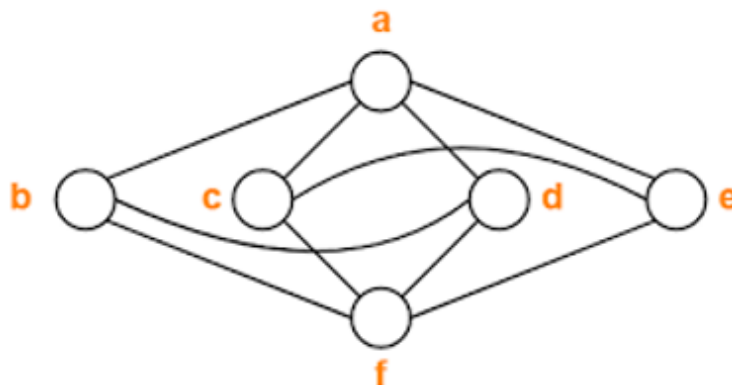
Distinguish between tractable and intractable problems? (3)

Group-C

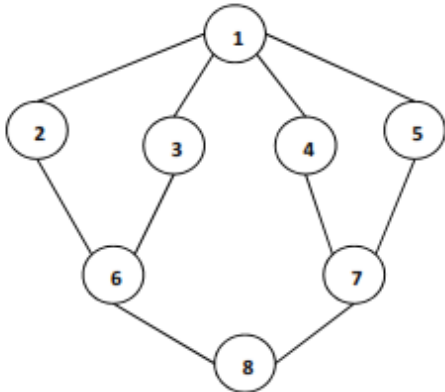
(Long Answer Type Questions)

5 x 6=30

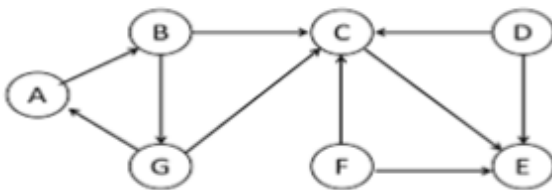
7. Find the minimum number of colors to color the following graph so that no two adjacent nodes have the same color. (5)



- 8. Write an algorithm to find the prefix function for string matching (5)
- 9. Write short notes on Polynomial time reductions with example (5)
- 10. Perform DFS traversal on the following graph starting from node 1. Where multiple node choices may be available for next travel, choose the next node in alphabetical order. (5)



- 11. What are different classification of edges that can be encountered during DFS operation and how it is classified? (5)
- 12. Perform BFS traversal on the above graph starting from node A. If multiple node choices may be available for next travel, choose the next node in alphabetical order. (5)



OR

(5)

Decide the items to be selected for optimizing the knapsack of capacity 8 to be filled by 4 objects of following specifications:

| ITEM | I | II | III | IV |
|--------|---|----|-----|----|
| PRICE | 1 | 2 | 5 | 6 |
| WEIGHT | 2 | 3 | 4 | 5 |
