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| **PES University Logo.jpg** | **PES University, Bangalore**  (Established under Karnataka Act No. 16 of 2013) | UE18CS251 |
| **MAY 2020: END SEMESTER ASSESSMENT (ESA) B.TECH.**  UE18CS251 **– Design and Analysis of Algorithms** | | |
| Time: 3 Hrs Answer all questions in the same order Max Marks: 100 | | |
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| 1 | a) | Solve by backward substitution method : C(n) = C(n/2) + C(n/2) + 1 for n > 1, C(1) = 0. | | 4 |
| b) | **Consider the Algorithm:**  **ALGORITHM** *what(A*[0..*n* − 1]*)*  //Input: Array *A*[0..*n* − 1] of numbers  *a*←∞  **for** *i* ← 0 **to** *n* − 1 **do**  **for** *j* ← 0 **to** *n* − 1 **do**  **if** *i !*= *j* **and** |*A*[*i*] − *A*[*j*]| *< a*  *a*← |*A*[*i*] − *A*[*j*]|  **return** *a*  Answer the following Questions:   * What is the outcome of the algorithm * Time efficiency * Improvement to decrease the time efficiency(alter the function ) | | 6 |
| c) | Indicate order of growth and prove your assertion   1. 2n lg(n + 2)2 + (n + 2)2 lg n/2 2. 3*n*2 log *n* 3. 5*n*+1 + 3*n*−1 | | 6 |
|  | d) | Prove that if t1(n) ∈ Ω(g1(n)) and t2(n) ∈ Ω(g2(n)), then  t1(n) + t2(n) ∈ Ω(max{g1(n), g2(n)}). | | 4 |
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| 2. | a) | First half of the array is filled with 0’s and second half of the array is filled with 1’s. Design an algorithm to Interchange the elements such that the array value after interchange should be 0,1,0,1,0,1…. With minimal moves. | | 6 |
| b) | Write non recursive binary search function | | 4 |
| c) | Describe the best and worst case analysis along with recurrence relation for Merge Sort | | 5 |
| d) | Write Quick sort partition algorithm | | 5 |
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| 3. | a) | Describe the variants of decrease and conquer technique with one example | | 5 |
| b) | Illustrate steps involved in topological sorting using DFS and order the vertices for the given graph | | 7 |
| c) | Illustrate and Sort using Heap sort 10,14,65,23,80,12,34 and mention the worst case time complexity of heap sort. Is heap sort a stable sorting algorithm? | | 8 |
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| 4. | a) | Implement a function to sort integers using Distribution Counting | | 4 |
| b) | Apply Boyer Moore’s string matching algorithm to find the Pattern: RECENT and Text: REGENTRELENTRESENTRODENTRECENTLY. | | 6 |
| c) | Find all possible subset sum for the value d=13, in the set S= {3,4,5,6} using Backtracking. | | 5 |
| d) | Encode the text DAD\_ADDED\_BED using Huffman coding and probabilities are  A=11, B=6,C=2,D=10,E=7,\_=10 | | 5 |
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| 5. | a) | Explain any two ways to find lower bound for algorithm with examples | 8 | |
| b) | Find solution for Knapsack problem using dynamic programming where the W=8 is the capacity of the knapsack, weights and values of items are w={2,3,4,5} V={1,2,5,6}. | 6 | |
| c) | Define the following with an example: i) Class P ii) Class NP iii) NP-Complete. | 6 | |