Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18CS3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED DATA STRUCTURES** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Give the algorithm for the insertion of a key into a binary search tree and construct the binary search tree with the following keys:  76, 32, 12, 90, 87, 98, 80, 65, 50. | CO4 | 8 |
| b. | Demonstrate max heap (priority queue) with the algorithm by constructing max heap for the following keys:  23, 56, 43, 98, 12, 97, 57, 65  Give the time complexity of the algorithm. | CO1 | 8 |
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| 2. | a. | Insert the keys 34, 12, 30, 10, 40, 15, 32, 31 and 20 into an empty splay tree. Alter the splay tree as a result of searching the key 30. Update the tree to result the deletion of the key 15. | CO4 | 8 |
| b. | List out the properties of Red black tree. Write down the different cases of issues for an insertion into red black tree. Construct a Red-black tree with the keys 32, 34, 65, 12, 19, 70, 53, 9, 40, 15, 76, 55. | CO4 | 8 |
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| 3. | a. | Write the algorithm for depth first traversal of a graph and construct the depth first tree for the following graph (alphabetical order can be followed to choose among many choices if any).  Image result for graph dfs search | CO5 | 8 |
| b. | Illustrate Prim’s algorithm to construct the minimum spanning tree for the following graph:  Related image | CO5 | 8 |
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| 4. | a. | Let there be a set of sorted sequences of the following lengths: D={3,5,7,9,12,14,15,17}. Build an optmial merge tree and calculate the maximum possible total number of comparisons required to merge all of them. | CO2 | 8 |
| b. | Find the solution for the following instance of Knapsack problem (partial) with maximum weight capacity W = 16, using greedy technique:   |  |  |  | | --- | --- | --- | | **ITEM** | **WEIGHT** | **VALUE** | | i1 | 6 | 6 | | i2 | 10 | 2 | | i3 | 3 | 1 | | i4 | 5 | 8 | | i5 | 1 | 3 | | i6 | 3 | 5 | | CO2 | 8 |
|  |  |  |  |  |
| 5. | a. | Apply dynamic programming technique to find shortest path between each pair of vertices in the following graph:  Image result for all pairs shortest path graph | CO2 | 8 |
| b. | Find the solution for the following instance of Travelling Salesman Problem by using dynamic programming technique:  Image result for travelling salesman problem using dynamic programming example | CO2 | 8 |
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| 6. | a. | Explain the types of Tries data structure and it’s application with suitable examples. | CO4 | 8 |
| b. | Compute the shortest path from the vertex ‘S’ to other vertices by applying Dijkstra’s shortest path algorithm:  Image result for dijkstra algorithm example | CO5 | 8 |
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| 7. | a. | A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:   |  |  | | --- | --- | | **character** | **Frequency** | | a | 5 | | b | 9 | | c | 12 | | d | 13 | | e | 16 | | f | 45 |   Note : Each character in input message takes 1 byte.  If the compression technique used is Huffman Coding, how many bits will be saved in the message? | CO2 | 8 |
| b. | Show how dynamic programming can be used to find the Longest common subsequence of the two DNA partial sequences:  “AGCTGCTTAG” and “AACTCCGTAAG” | CO2 | 8 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Describe how backtracking technique can be used to solve the problem of Sum of subsets with appropriate example. | CO3 | 10 |
| b. | Write a detailed note on the class P,NP and NP complete problems. | CO6 | 10 |