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**Mid-Term Examinations – July 2024**

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| Programme | : | **B. Tech** | Semester | : | **Fall 2024-25** |
| Course Title | : | **Data Structures and Algorithms** | Course Code | : | **CSE2002** |
| Date/Session | : | **16 July 2024/ Session II** | Slot | : | **A11+D11+A12+D12+A13** |
| Time | : | **1 ½ hours** | Max. Marks | : | **50** |

**Answer all the Questions**

| Q.No. | Question Description | Marks |
|---|---|---|
| 1 | If f(n) is the frequency count of given algorithm and g(n) is the standard time complexity function, draw the graphical representation of Big (O), Big Omega, and Big Theta notations and differentiate all the notations. Also Discuss which notations are used to represent the best, average, and worst-case time complexity. Specify the role of constant c in representing the time complexity in these notations. | **10** |
| 2 | Write a recursive algorithm to search for the meaning of the word "hope" in the dictionary. Form a recurrence relation for this problem and solve it to get the value of time complexity. Discuss the best, average, and worst case time complexity for the above searching problem. | **10** |
| 3 | Write an algorithm to sort 'n' elements of an array such that it requires O (n log n) time and O (n) space complexity. Use the divide and conquer method to write the algorithm. What will be the recurrence relation of your algorithm? | **10** |
| 4 | Consider the following array: 5,6,2,8, 3,1,9,7. Apply the quick sort algorithm to sort this array. How much time and space in the memory is required to solve your problem? | **10** |
| 5 | Discuss the limitations of implementing a list using array. Consider the following list: 6, 2, 8, 4. Write an algorithm to create a singly linked list of the items given. | **10** |

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