

**VIT[®]**Vellore Institute of Technology
(Instituted in the University under section 3 of U.G. Act, 1956)**School of Computer Science and Engineering****Winter Semester 2023-2024****Continuous Assessment Test – 1****Programme Name & Branch: B.Tech (BCB/BCE/BCI/BCT/BDS/BKT) Slot : A1+TA1****Course Name & code: BCSE204L – Design and Analysis of Algorithms****Class Number (s): ALL****Faculty Name (s): ALL****Exam Duration: 90 Mins.****Max. Marks: 50****General instruction(s): ANSWER ALL THE QUESTIONS**

| Q.No. | Question |
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| 1. | (a) Discuss the selection sort algorithm by providing its pseudo code. Discuss the loop invariant in perception with selection sort algorithm. Check the proof of correctness for the same. (4-Marks) |
| | b) Using the master's theorem, solve the recurrence relation (i) $T(n) = 4T\left(\frac{n}{2}\right) + n^2 \Rightarrow n^2$ (ii) $T(n) = 7T\left(\frac{n}{2}\right) + 18n^2$ (6-Marks) |
| 2. | Consider the string "shesellsseashellsbytheseashores". Use minimum number of bits for transmitting the said string. Calculate the number of bits used to encode this using Huffman coding technique. Identify the bits required in both fixed-size and variable length encoding. (10-Marks) |
| 3. | Design and develop an algorithm to multiply 2 integers and analyze their time complexity. Illustrate the technique to multiply the numbers 1334, and 1253. (10-Marks) |
| 4. | Provide the optimal parenthesization while multiplying the matrices A1, A2, A3, A4, A5 having dimensions mentioned below. (10-Marks) |

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| A1 | 2×5 |
| A2 | 5×10 |
| A3 | 10×5 |
| A4 | 5×6 |
| A5 | 6×10 |

Define 6-Queens problem. Assuming that the queens are placed column-wise in the 6-Queens problem solved using backtracking. Consider the following intermediate state where the queens are attacking each other. Show the steps that involve backtracking to attain the solution where no queen attacks the other. (10-Marks)

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