**ASSIGNMENT**

**DESIGN AND ANALYSIS OF ALGORITHMS**

**By**

***Student Name:***

**Roll Number:**

**Semester: 3rd**

**Department of Computer Science and Engineering**

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**Model Institute of Engineering & Technology (Autonomous)**

(Permanently Affiliated to the University of Jammu, Accredited by NAAC with “A” Grade)

Jammu, India

2023

**ASSIGNMENT**

**Subject Name: Design and Analysis of Algorithms**

**Subject Code: COM-301**

**Due Date: 15 December 2023**

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| --- | --- | --- | --- | --- |
| **Question Number** | **Course Outcomes** | **Blooms’ Level** | **Maximum Marks** | **Marks Obtained** |
| Q1 | CO3, CO4, CO5 | 4-5 | 20 |  |
| **Total Marks** | | | 20 |  |
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**Assignment Objectives:**

The objective of this assignment is to comprehensively compare Strassen's Matrix Multiplication and General Matrix Multiplication algorithms for matrix operations and evaluate the application of a Greedy Algorithm in solving the Job Scheduling Problem. The focus will be on understanding their implementations, functions, time complexity, and experimental results.

**Assignment Instructions:**

* Submit a well-organized report with clear headings and subheadings provided in the template.
* Include code snippets where necessary for clarification.
* Ensure proper citation of sources.
* Submit the assignment before due date.

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| **Q. No.** | **Question** | **BL** | **CO** |
| **1** | **Analyzing Strassen's Matrix Multiplication, General Matrix Multiplication, and Greedy Algorithm in Job Scheduling Problem**  **Assignment Components:** Introduction, Background and Problem Definition, Algorithms Analysis, Experimental Results, Conclusion and References. | 4-5 | CO3,CO4,CO5 |

**Assignment Components:**

1. **Introduction: (4 Marks)**
   * Provide a brief overview of the matrix multiplication problem and its significance in computing.
   * Clearly state the goal of the project, which is to compare Strassen's Matrix Multiplication, General Matrix Multiplication, and a Greedy Algorithm in solving specific problems.
2. **Background and Problem Definition: (4 Marks)**
   * Define matrix multiplication and its applications.
   * Introduce Strassen's Matrix Multiplication and General Matrix Multiplication algorithms.
   * Briefly explain the Greedy Algorithm and its relevance in solving the Job Scheduling Problem.
   * Specify the programming language to be used (e.g., Python).
3. **Algorithms Analysis: (4 Marks)**

**Strassen's Matrix Multiplication:**

* + Describe the key functions used in Strassen's algorithm.
  + Discuss the divide-and-conquer approach and how it improves traditional matrix multiplication.
  + Explain the time complexity of Strassen's algorithm.

**General Matrix Multiplication:**

* + Describe the standard algorithm for matrix multiplication.
  + Explain the time complexity of general matrix multiplication.

**Greedy Algorithm in Job Scheduling Problem:**

* + Explain the Job Scheduling Problem and its significance.
  + Introduce the Greedy Algorithm for solving job scheduling.
  + Describe key functions of the Greedy Algorithm in the context of job scheduling.
  + Discuss the advantages and limitations of the Greedy Algorithm in this problem.

**Time Complexity Analysis:**

* + Clearly state the time complexities of Strassen's Matrix Multiplication, General Matrix Multiplication, and the Greedy Algorithm in Job Scheduling.
  + Discuss the factors contributing to the time complexity, emphasizing the growth rates concerning matrix sizes and job scheduling instances.

1. **Experimental Results: (4 Marks)**
   * Present the experimental results with different matrix sizes for both multiplication algorithms.
   * Include visual representations (figures) illustrating the matrix multiplication results.
   * Analyze and interpret the results, commenting on the efficiency of Strassen's and General Matrix Multiplication algorithms.
2. **Conclusion: (2 Marks)**
   * Summarize the findings and conclusions drawn from the experimental results.
   * Clearly state which matrix multiplication algorithm is more efficient under different scenarios.
   * Discuss the effectiveness of the Greedy Algorithm in solving the Job Scheduling Problem.
3. **References: (2 Marks)**
   * Provide proper citations for references used in the report, including books, articles, and online resources.

**Rubrics for Assessment (Total Marks -20)**

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| --- | --- | --- | --- | --- | --- |
| **Criteria** | **Excellent (4)** | **Good (3)** | **Satisfactory (2)** | **Needs Improvement (1)** | **Unacceptable (0)** |
| **Introduction** | 4 | 3 | 2 | 1 | 0 |
| Overview and Goal | Provides a comprehensive and compelling overview of the problem or topic. Clearly states the goal or purpose of the assignment. | Provides a clear overview and states the goal of the assignment. | Provides a basic overview and states the goal with some ambiguity. | Provides an incomplete or unclear overview and goal. | Does not provide an overview or state the goal. |
| **Background and Problem Definition** | 4 | 3 | 2 | 1 | 0 |
| Definition and Significance | Clearly defines key terms or concepts related to the problem or topic. Explains their significance. | Defines key terms or concepts with good clarity. Explains their significance. | Defines terms or concepts with some ambiguity. Explains significance with some confusion. | Provides incomplete or unclear definitions. Lacks explanation of significance. | Does not define terms or concepts. |
| Introduction of Tools/Methods | Briefly introduces any tools, methods, or languages used in the assignment. | Introduces tools or methods with good clarity. | Introduces tools or methods with some ambiguity. | Provides incomplete or unclear introductions. | Does not introduce tools or methods. |
| **Analysis and Discussion** | 4 | 3 | 2 | 1 | 0 |
| Algorithm or Approach | Describes the chosen algorithm or approach comprehensively. Discusses the logic or methodology thoroughly. | Describes the chosen algorithm or approach clearly. Discusses the logic or methodology with good clarity. | Describes the algorithm or approach with some ambiguity. Discusses the logic or methodology with some confusion. | Describes the algorithm or approach incompletely or unclearly. Discusses the logic or methodology unclearly. | Does not describe the algorithm or approach. |
| Technical Details | Provides in-depth technical details relevant to the assignment. Demonstrates a deep understanding. | Provides technical details with good clarity. Demonstrates a solid understanding. | Provides technical details with some ambiguity. Demonstrates some understanding. | Provides incomplete or unclear technical details. Demonstrates lack of understanding. | Does not provide technical details. |
| **Presentation of Results** | 4 | 3 | 2 | 1 | 0 |
| Data Presentation | Presents data or results with clarity, including visual representations if applicable. | Presents data or results with good clarity. | Presents data or results with some ambiguity. | Presents incomplete or unclear data or results. | Does not present data or results. |
| Analysis and Interpretation | Analyses and interprets results thoroughly, providing insightful commentary. | Analyses and interprets results with good clarity. Provides meaningful commentary. | Analyses and interprets results with some ambiguity. Provides commentary with some confusion. | Analyses and interprets results incompletely or unclearly. Lacks meaningful commentary. | Does not analyse or interpret results. |
| **Conclusion** | 2 | 1 | 0 | - | - |
| Summary and Reflection | Summarizes findings or key points effectively. Reflects on the significance of the results. | Summarizes findings with good clarity. Reflects on the significance of the results with good clarity. | Summarizes findings with some ambiguity. Reflects with some confusion. | Summarizes findings incompletely or unclearly. Lacks reflection on significance. | Does not summarize findings or reflect on significance. |
| **References** | 2 | 1 | 0 | - | - |
| Proper Citations | Provides proper citations for references used in the assignment comprehensively. | Provides proper citations with good clarity. | Provides proper citations with some ambiguity. | Provides incomplete or unclear citations. | Does not provide proper citations. |

**Format Guidelines**

**Title Page:** Use the Standardized Front Page shared by the Department.

**Font and Spacing:** Use a Times New Roman in 12-point size.

1.5 line spacing in the entire document, including the title page, headings, and references.

**3. Margins:** Set 1-inch (2.54 cm) margins on all sides of the paper.

**4. Header:** Include a header as Assignment and Course Code in the top right corner of each page (except the title page).

**5. Title:** Center the title of your assignment at the top of the first page. It should be bold and capitalized.

**6. Headings:** Use headings and subheadings to organize your content. Typically, use bold for main headings (e.g., "Introduction") and italics for subheadings (e.g., "*Methods*").

**7. Page Numbers:** Page numbers should be placed in the center of footer of each page, starting from the second page (the title page is page 1 & should not be numbered).

**8. Citations and References:** Use a consistent APA citation style to cite references.

**9. Figures and Tables:** If you include figures or tables, provide clear labels and captions. The figure number should be placed below the Figure as “**Figure 1**: Figure name” and for the tables, the table number must be mentioned above the table as “**Table 1:** Table name”.

**10. Appendices (if needed):** Include appendices for supplementary materials, such as charts, graphs, or lengthy data tables.

**11. Submission Format:** Submit your assignment in the soft copy format as PDF and upload it on CAMU as per the submission deadline. Please ensure that the assignment is renamed as Roll Number.

**12. Proofreading and Editing:** Carefully proofread and edit your assignment for clarity, grammar, and spelling errors before submission.

**13. Plagiarism:** Plagiarism must be below 15 percent for the assignment submitted.