T1 2024: ICT201 Computer Organisation and Architecture

Assessment 4

Assessment type: Report (2,000 words) – individual assignment

Purpose: This assignment aims to explore and implement synchronization strategies in operating systems, emphasizing critical sections, semaphores, the producer-consumer problem, deadlock handling, concurrency control in file systems, and real-world case studies. This assessment contributes to Learning Outcomes a, b and c.

Value: 25% (Report 15%; Presentation 10%)

Due Date: Report Submission via Moodle (Week 9 Sunday 23:59); Presentation (Week 10 – 11)

Submission: Upload the completed report via Moodle.

Assessment Topic: Synchronization Strategies in Operating Systems: A Comprehensive Exploration

Task Details:

This assignment aims to explore and implement synchronization strategies in operating systems, emphasizing critical sections, semaphores, the producer-consumer problem, deadlock handling, concurrency control in file systems, and real-world case studies.

Important Notes:

- You should use other resources like internet resources, books, journals, and conferences.

- Ensure your report is well-organized with a **clear structure**. Utilize the Content Breakdown as a helpful guide.

- Get ready for a concise presentation of your report and deliver it to the entire class during the tutorial session in either week 10 or 11. **There is no requirement to submit any files for the presentation.**

- You must provide references and cite the resources you consulted for this assignment.

- **Harvard referencing** is the required method. (APA is acceptable)

- Make sure your resources are timely. For example, notice the date when the research was published. Be sure to validate the authenticity of your sources. Avoid any that might be questionable, such as blogs and publicly edited online (wiki) sources.

Coursebook: Stallings, W. (2018). Operating System: internals and design principles. 9th ed. Essex: Pearson Education Limited.

Content Breakdown (Approximate Word Count for Each Section):

1. Introduction (200 words):

   - Brief overview of the importance of synchronization in operating systems.

   - Introduction to the key synchronization challenges addressed in the assignment.

2. Critical Section Problem and Solution Techniques (400 words):

   - Explanation of the critical section problem.

   - Exploration of solution techniques, including semaphores, locks, or other synchronization primitives.

   - Discussion on challenges related to mutual exclusion, progress, and bounded waiting.

3. Semaphore Implementation (300 words):

   - Scenario creation with multiple processes/threads accessing shared resources.

   - Demonstration of how semaphores enforce synchronization.

4. Producer-Consumer Problem (300 words):

   - Discussion of the producer-consumer problem.

   - Implementation of a solution using synchronization mechanisms.

   - Explanation of how proper data sharing and synchronization between producers and consumers are ensured.

5. Deadlock Handling (300 words):

   - Investigation of different deadlock handling mechanisms.

   - Examples of situations leading to deadlock.

   - Demonstration of how each mechanism helps prevent or recover from deadlock.

6. Concurrency Control in File Systems (300 words):

   - Exploration of concurrency control mechanisms in file systems.

   - Discussion on how concurrent access to files is managed for data consistency and integrity.

   - Examples and scenarios illustrating the importance of concurrency control.

7. Real-world Operating System Case Study (300 words):

   - Selection of a real-world operating system for analysis.

   - Discussion on how the operating system handles process synchronization challenges.

   - Insight into the strategies, mechanisms, and algorithms employed.

8. Conclusion (200 words):

   - Summary of key findings and insights from the exploration of synchronization strategies.

   - Reflection on the practical relevance and implications of the discussed concepts.

Assessment 4 Marking Rubrics - Report:

Criteria	Unsatisfactory	Satisfactory	Effective	Excellent	Exceptional	15 %
Content	Fail (0 – 49%)	Pass (50 – 64%)	Credit (65 – 74%)	Distinction (75 – 84%)	High Distinction (85 – 100%)	
Depth of Content	The explanation is sufficiently inaccurate, incomplete, or confusing that the reader gains little information from the report. It appears that little attempt has been made to help the reader understand the material.	Some difficulty in reading, structure lacking in some parts	Well written, structure not totally clear	Well written and structured.	An accurate and complete explanation of key concepts and theories is made, drawing on relevant literature. Enough detail is presented to allow the reader to understand the content and make judgments about it. In addition, applications of theory are included to illuminate issues. Readers gain insights.	3
Accuracy of Content	Does not directly answer question	Directly answers most of the question	Directly answers the question	Directly answers the question giving additional insights	Information (names, facts, etc.) included in the report is consistently accurate.	3
Clarity of Purpose	No support for the project's objectives taken in the answer.	Provides some support for the project's objectives taken.	The project's objectives are presented. The motivation for pursuing the project and its relevance are addressed. The discussion is reasonably clear but not compelling.	Provides excellent level of support for project's objectives taken.	The project's objectives are clearly stated. The motivation for pursuing the project and its relevance are clearly and persuasively established by relating the project to current engineering problems.	3
Depth of Analysis	No analysis presented	Analysis based on some argument	Analysis based on sound argument	Analysis based on an extensive argument	Results are carefully and objectively analysed. Interpretations are made using appropriate equations, models, or theories.	3
Use of Language: Word Choice, Grammar, and Sentence Structure	Very little knowledge of subject matter demonstrated.	Adequate knowledge of subject matter demonstrated.	Sound knowledge of subject matter demonstrated.	High level of knowledge of subject matter demonstrated.	High level of knowledge of subject matter and synthesis with theory demonstrated	3

Marking Rubrics: Presentation (10%)

Criteria	Fail (0 – 49%)	Pass (50 – 64%)	Credit (65 – 74%)	Distinction (75 – 84%)	High Distinction (85 – 100%)	10%
Visual appeal	There are many errors in spelling, grammar, and punctuation, the slides are difficult to read and contain too much text, poor choice of fonts and colours, no or little visual appeal,	There are errors in spelling, grammar, and punctuation. Too much text on many slides. Minimal effort made to make slides appealing	There may be some errors in spelling, grammar and punctuation. Too much text on two or more slides. Significant visual appeal.	There are no errors in spelling, grammar, and punctuation. Information is clear and concise on each slide. Visually appealing and engaging.	No errors, engaging and professional looking presentation	2
Content	The presentation provides a brief look at the topic but many questions are left unanswered. Majority of information is irrelevant and significant points left out.	The presentation Is informative but several elements are unanswered. Much of the information irrelevant, coverage of some of major points.	The presentation is a good summary of the topic. Most important Information covered; little irrelevant information.	The presentation is a concise summary of the topic with all questions answered. Comprehensive and complete coverage of information.	Exceptionally good summary of the topic and provides extensive supportive elements to aid the ease of understanding of the audience.	4
Presentation skills	Minimal eye contact focusing on small part of audience. The audience is not engaged. Spoke too quickly or quietly making it difficult to understand. Inappropriate/disinterested body language.	Focuses on only part of the audience. Sporadic eye contact and the audience is distracted. Speaker could be heard by only half of the audience. Body language is distracting.	Speaks to majority of the audience; steady eye contact. The audience is engaged by the presentation. Speaks at a suitable volume with some fidgeting.	Regular/constant eye contact, The audience is engaged, and presenter held the audience's attention. Appropriate speaking volume & body language.	Exceptionally Good presentation skills, excellent audience engagement.	4