**Assignment Cover Sheet**

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| **Qualification** | | **Module Number and Title** |
| HD in Computing and Software Engineering/ HD in Network technology and Cyber Security | | Computer Architecture – CSE 4001 **“Operating Principles of the Computer Architecture”** |
| **Student Name & No.** | | **Assessor** |
|  | |  |
| **Hand out date** | | **Submission Date** |
|  | |  |
| **Assessment type**  WRIT1-Coursework | **Duration/Length of**  **Assessment Type**  3 weeks (3000 Words) | **Weighting of Assessment**  100% |

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| --- | --- |
| **Learner declaration** | |
| I, …………………………………………. <name of the student and registration number>, certify that the work submitted for this assignment is my own and research sources are fully acknowledged. | |
| |  |  |  |  | | --- | --- | --- | --- | | **Marks Awarded** | | | | | First assessor | |  | | | IV marks | |  | | | Agreed grade | |  | | | Signature of the assessor |  | Date |  | |

**Feedback Form**

**International College of Business & Technology**

**Module:** Computer Architecture - CSE4001

**Student:**

**Assessor:**

**Assignment:** Operating Principles of the Computer Architecture

**Strong features of your work:**

**Areas for improvement:**

**Marks Awarded:**

**Coursework**

**Learning outcomes covered**

1. **LO1:** Explain the principles of the architecture and organization of computer systems.
2. **LO2:** Explain the fundamental aspects of all digital computers and the operating principles of computer peripherals
3. **LO 03:** Relate the principles underlying operating systems and system software

**Part 01 Tasks**

1.Digital systems use a variety of different number systems. The number system is a way of expressing numbers. Number system conversions deal with the operations to change the base of the numbers. (Show your method) (LO 01) (10 marks)

a) Convert the following values into hexadecimal

i. 6518

ii. 73578

b) Give the 8-bit 2's complement signed representation of following values.

i. -84

ii. -13

2. In binary system each and every number and its sign are represented by using only these two digits 0 and 1. As the negative and positive signs cannot be written directly in binary system. The alternative method to represent negative and positive numbers is the 2’s complement method. It has an interesting property that the binary arithmetic operation can be performed easily on signed or unsigned numbers. Compute the following binary arithmetic operations using 2’s complement method. Show all the steps clearly. (LO 01) (10 marks)

a) Sum of -15 and 27

b) Sum of -42 and -13

3.Simplify the following expressions using Boolean algebra rules and specify which rule is being used in each step. (LO 01) (10 marks)

a) Simplify the expression (A + B) (A + C + B) using Boolean algebra rules.

b) Simplify the expression A'BC + AB' + BC' using Boolean algebra rules.

c) Simplify the expression (A + B) (A' + B') (C + D) using Boolean algebra rules.

4. A security access system consists of four sensors to detect unauthorized access to a restricted area. The sensors include a fingerprint scanner, a facial recognition camera, a proximity sensor, and a voice recognition module. Each sensor can either be active (sends the logical value 1) or inactive (sends the logical value 0). The system triggers an alarm (A) when any three of the sensors are simultaneously active, or when the fingerprint scanner and any two of the remaining sensors are active. The system is designed to prevent unauthorized access by detecting multiple sensor activations or specific combinations of sensor activations. A = Fingerprint scanner sensor, B = Facial recognition camera sensor, C = Proximity sensor, D = Voice recognition module

The system's triggering and alarm conditions can be defined as follows:

•Condition 1: Three sensors are simultaneously active (A, B, and C; A, B, and D; A, C, and D; or B, C, and D)

•Condition 2: The fingerprint scanner and any two of the remaining sensors are active (A and B and C; A and B and D; A and C and D; or B and C and D)

Trigger and Discard Rules:

•If any three of the sensors (A, B, and C; A, B, and D; A, C, and D; or B, C, and D) are simultaneously active, the system triggers an alarm and denies access.

•If the fingerprint scanner and any two of the remaining sensors (A and B and C; A and B and D; A and C and D; or B and C and D) are active, the system triggers an alarm and denies access.

In summary, the security access system triggers an alarm and denies access when any three of the sensors are simultaneously active or when the fingerprint scanner and any two of the remaining sensors are active. (LO 01) (20 marks)

a) Construct a truth table for this system

b) From the truth table write down a Boolean equation.

c) Using either Boolean algebra or Karnaugh maps, obtain a simplified expression.

d) Draw a circuit to implement the security access system.

**Part 02 Tasks**

**Assignment Brief**

Concept Innovations is an innovative technology company based in Colombo. Due to the company's growth, they have decided to expand their operations to Kandy, where they plan to set up a new branch within the next three months. As part of this expansion, they are considering the hardware and IT infrastructure requirements for their new location and future projects.

Branch Director (1)

Project Managers (5)

UX/UI Designers (8)

Software Engineers (10)

Quality Assurance Team (6)

Database Administrators (4)

Business Analysts (5)

Accounting Team (3)

Front Desk Coordinator (1)

IT Department (6)

IT Administrator (1)

IT Support (5)

Assume that you are the newly appointed IT executive of Concept Innovations and it is your responsibility to provide system specification for the organization considering the roles and responsibility of the employees.

**Tasks**

1. Identify and recommend types of computer systems (CPU, Motherboard Specifications, Graphics processing unit, Storage, and Memory) with relevant examples for all the departments with a proper justification. **(LO1) (10 Marks).**
2. Produce a user requirement analysis report and identify software requirements for each functional area of the organization considering the roles and the responsibilities of the employees. **(LO2) (10 Marks)**
3. Produce system design specifications to meet the user needs of each functional area while considering different types of computer systems (Consider the computer Input, Output and other hardware devices which are necessary to satisfy the user requirements.) **(LO2) (10 Marks)**
4. Provide an honest assessment of the strength and weaknesses of your design. Provide detailed recommendations with innovative ideas. Recommend the enhancements you could include in this design in terms of hardware, software, and maintenance. **(LO2) (10 Marks)**
5. Evaluate the suitability of the operating system for the given scenario. **(LO3) (10 Marks)**

**Note: You can make any valid assumptions and you need to mention your valid assumptions clearly**

**Submission Guidelines**

**Report Format:**

* Submission format Report
* Paper Size: A4
* Words: 3000 words
* Printing Margins: LHS; RHS: 1 Inch
* Binding Margin: ½ Inch
* Header and Footer: 1 Inch
* Basic Font Size: 12
* Line Spacing: 1.5
* Font Style: Times New Roman

**Referencing Guidance**

* To use Harvard referencing for citation and compile reference list you can go through following guidance provided by Anglia Ruskin University.
* In the Harvard system, the author's surname and year of publication are cited in the text of your work. The full details of the source are included in a **reference list** at the end of the assignment.

(Anglia Ruskin University, 2013)

**You can follow below link for more details**

Guide to the Harvard Style of Referencing. University Library. [pdf] Anglia Ruskin University. Available at: <https://library.aru.ac.uk/referencing/files/QuickHarvardGuide2019.pdf> (A.R.U.)

A.R.U. (n.d.). *Guide to the Harvard System*. Retrieved 05 01, 2020, from www.library.aru.ac.uk: https://library.aru.ac.uk/referencing/files/QuickHarvardGuide2019.pdf

**Resources**

**Books**

* Hennessy, J. and Patterson, D., 2019. Computer Architecture. Cambridge, MA: Elsevier.
* Clements, A., 2006.The Principles of Computer Hardware, 4th ed. New York, Oxford University Tanenbaum, Andrew, S., 2014 Modern Operating Systems, 4th ed. Amsterdam: Vrije university.

**Part 01 Tasks**

**Assessment Criteria**

**Task (1) contains 10 marks.**

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 10** |
| **Fail**   * Poor representation of numbers. | **1 - 2** |  |
| **Pass**   * Provide correct answers with minor mistakes ( two parts have been answered correctly) | **3 - 5** |  |
| **Good**   * Accurate answers for all the questions minor mistakes. | **6- 7** |  |
| **Excellent**   * Accurate and clear answers for all the questions. | **8 - 10** |  |

**Task (2) contains 10 marks.**

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Marks** | **Marks obtained by the student** |
| **Out of 10** |
| **Fail**   * Poor and less accurate answers provided in a careless manner. | **1 - 2** |  |
| **Pass**   * Provide correct answers with minor mistakes ( two parts have been answered correctly) | **3 - 5** |  |
| **Good**   * Accurate answers for all the questions minor mistakes. | **6- 7** |  |
| **Excellent**   * Accurate and clear answers for all the questions * Shown all steps clearly | **8 - 10** |  |

**Task (3) contains 10 marks.**

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| **Criteria** | **Marks** | **Marks obtained by the student** |
| **Out of 10** |
| **Fail**   * Poor and less accurate answers provided in a careless manner. | **1 - 2** |  |
| **Pass**   * Provide correct answers with minor mistakes (three parts have been answered correctly and specified the Boolean Algebra rules applied for each step of simplification) | **3 - 5** |  |
| **Good**   * Accurate answers for all the questions minor mistakes. (Specified the Boolean Algebra rule applied for each step of simplification) | **6- 7** |  |
| **Excellent**   * Accurate and clear answers for all the questions. Shown all steps clearly. Specified the Boolean Algebra rule applied for each step of simplification | **8 - 10** |  |

**Task (4) contains 20 marks.**

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| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 20** |
| **Fail**   * Poor explanation and table with lacking details and values | **0-5** |  |
| **Pass**   * Construct the truth table and Boolean equation with minor mistakes. | **6-10** |  |
| **Good**   * Construct the truth table and Boolean equation correctly. Simplification has been done accurately. * Draw the circuit with minor mistakes. | **11-15** |  |
| **Excellent**   * Construct the truth table and Boolean equation correctly. Simplification has been done accurately. * Draw the circuit correctly with AND, OR, NOT gates. | **16-20** |  |

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| **This submission will be assessed as follows** | **Total marks Allocated** | **Marks obtained by the student** |
| Task 1 | 10 |  |
| Task 2 | 10 |  |
| Task 3 | 10 |  |
| Task 4 | 20 |  |
| **Total Marks** | **50** |  |

**Part 1**

**Part 02 Tasks**

**Assessment Criteria**

**Task (1) contains 10 marks.**

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 10** |
| **Fail**   * Learner has not correctly identified the type of computers for each department. | **1 - 2** |  |
| **Pass**   * Learner has identified a few types of computer systems. | **3 - 5** |  |
| **Good**   * Identification of few types of computer systems with relevant examples. And choices have well justified. Some minor technical errors and misconceptions. Sources acknowledged well. | **6- 7** |  |
| **Excellent**   * Identification and recommendation of types of computer systems (Servers / PCs / Laptops and their detailed Specifications) with relevant examples for all the departments with a proper justification. * No conflicts arise from using components together. Multiple sources of information used and referenced correctly with valid sources. | **8 - 10** |  |

**Task (2) contains 10 marks.**

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| --- | --- | --- |
| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 10** |
| **Fail**   * Learner has not correctly identified the roles and responsibility of employees. | **1 - 2** |  |
| **Pass**   * Identifying software requirements of the required computers. Only application software’s have included. | **3 - 5** |  |
| **Good**   * Produce user specifications for client and server computer systems with proper justification. Application and System Software’s have been correctly explained with examples. | **6- 7** |  |
| **Excellent**   * Produce specifications for client and server computer systems with proper justification and examples. Application and System Software’s have been correctly explained. * Recommending and justifying suitable user requirements analysis for each department. | **8 - 10** |  |

**Task (3) contains 10 marks.**

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| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 10** |
| **Fail**   * Fail to achieve minimum criteria such as identification of input, output Peripherals | **1 - 2** |  |
| **Pass**   * Produce input / output peripherals with explanation. | **3 - 5** |  |
| **Good**   * Produce appropriate specification for each department and have been correctly explained with examples. | **6- 7** |  |
| **Excellent**   * Produce appropriate system specification Identifying roles and responsibilities for each department with example and Justification. * No conflicts arise from using components together. Multiple sources of information used and referenced correctly with valid sources. | **8 - 10** |  |

**Task (4) contains 10 marks.**

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| **Criteria** | **Marks** | **Marks obtained by the student** |
| **Out of 10** |
| **Fail**   * Student failed to answer the task as instructed or * Learner has not given proper explanation of Kernel and System Calls or the information provided are not valid, accurate and not up to the standard. * Poor presentation of information with lot of grammatical and technical mistakes. | **1 - 2** |  |
| **Pass**   * Student has demonstrated the information in a fairly poor way. Some part of the question is not covered, but it was seen that student has put an effort to answer the given question. * Learner has provided a simple explanation OSs. * Answer is not structured, information is scattered which showed that student had poor theoretical knowledge and the application knowledge. | **3 - 5** |  |
| **Good**   * Student has demonstrated a very good understanding and identification of Kernel and System Calls related to OS * Good effort to make the answer more logical and structured. | **6- 7** |  |
| **Excellent**   * Student has demonstrated an excellent in-depth understanding, proper identification and accurate presentation of information on “OS * Well-structured logical answer is provided with the aid of valid sources, diagrams and examples. * Learner has done research about the new technologies related to the question asked and included proper references. | **8 - 10** |  |

**Task (5) contains 10 marks.**

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| **Criteria** | **Marks** | **Marks obtained by the student for the answer provided** |
| **Out of 10** |
| **Fail**   * Poor explanation. Fail to achieve minimum criteria. No enhancements have been suggested | **1 - 2** |  |
| **Pass**   * Leaner has explained possible future enhancements for the company in terms of hardware and software. | **3 - 5** |  |
| **Good**   * Leaner has explained possible future enhancements for the company in terms of hardware, software. * Identify the proper maintenance policies for the company with a justification. | **6- 7** |  |
| **Excellent**   * Proper Justification for all the departments including examples and the latest technologies which can be used to enhance their performance. * Identify the proper maintenance policies for the company with a justification. * Answer shows excellent research skills of the learner. Future recommendations should be given based on the enhancements. | **8 - 10** |  |

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| --- | --- | --- |
| **This submission will be assessed as follows** | **Total marks Allocated** | **Marks obtained by the student** |
| Task 1 | 10 |  |
| Task 2 | 10 |  |
| Task 3 | 10 |  |
| Task 4 | 10 |  |
| Task 5 | 10 |  |
| **Total Marks** | **50** |  |

**Part 2**

**Final Grading criteria:**

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| --- | --- |
| Marks | Final Grade |
| >=70 | Distinction |
| 69-55 | Merit |
| 54-40 | Pass |
| <40 | Fail |