## General
For ALL Word processing documents, you must submit your documents in one of the following formats: MS-Word (.doc/.docx) or PDF (common read only format). They will be returned ungraded if submitted in any other format.

Submit assignments all assignments via elearn - attach your word document to your submission. Do NOT copy and paste your document into the submission text box. (It mangles formatting and makes it much harder for me to read submissions).

## Assignment Instructions
Below are the questions for the assignment. Write your answers in the separate Answer document  Optional challenge questions are just for your own learning; they do not count toward grading.

### Part 1: Operating Systems Concepts

**Q1:** For each of the items below, describe in one or two sentences how the operating system provides either allocation or abstraction of the resource:

A. Allocation of Processors:

B. Abstraction of Hard Drive:

C. Allocation of Memory:

D. Abstraction of Memory:

### Part 2: Parallel Processing

**Q2:** According to Moore’s Law, how many times more powerful should computers be in 18 years? Show work.

**Q3:** For a given task, 80% of the work can be done in parallel. How many times faster could we get the work done with:

A) 2 workers?
B) 4 workers?
C) 100 workers?
Show work.

**Q4:** Two people are eating Chinese food but only have two chop sticks. Each grabs one and then stares at the other person hoping they put their stick down (you need two chopsticks to eat).

A. How are the three requirements for deadlock met here?

B. What is a rule that could be in place to prevent deadlock? Specify which condition your rule addresses.

**Q5:** Do BYOB Tutorial 5 Exercise 1 (From Ch5.2) Report your findings. For each part, make sure to run multiple times. Does the same thing always happen? Can you get different results? Make sure to describe what happens AND why it happens that way.

**Q6:** Do BYOB Tutorial 5 Exercise 2 (From Ch5.4).

A. What happens as you add threads?

B. What does the character do when the thread count hits 6? Why?
Part 3: Databases and Consistency

Q7: Why can I detect an inconsistency in a table of friends but not in one of bank accounts?

Q8: Here is a table with information about some students:

<table>
<thead>
<tr>
<th>Name</th>
<th>StudentID</th>
<th>Credits</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joe Smith</td>
<td>123456</td>
<td>20</td>
<td>3.2</td>
</tr>
<tr>
<td>Abby Jones</td>
<td>234567</td>
<td>24</td>
<td>3.6</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

And a ToDo list transaction based on Joe earning an A in a 4 credit class.

Start transaction
Add 4 credits to Joe
Change Joe’s GPA to 3.66
End transaction

A) Why are the actions not idempotent? What could go wrong if we crash midway through the list?

B) Rewrite the todo list so that the actions are idempotent:

Q9: How does a rollback allow a deadlock to be resolved? Which of the three conditions for deadlock does it eliminate?

Q10: Write a query (do NOT give me the DATA, give me the query that produces the data) that would do the following:

A) Find the name and how many years employed for each employee with 5 or more years service in this Employees table:

You can use the practice areas on this webpage to experiment with this table.
https://sqlbolt.com/lesson/select_queries_with_outer_joins

The actual exercises on that page are different (and you do not need to be able to do them), but you can use the practice area to test your query.
B) Find the name, building they work in and capacity of that building for every employee who is an Artist using the tables Employee and Buildings shown below.

*Hint: when writing *Artist* in your query, put quotes around it like: “Artist”*

You can use the practice areas on this webpage to experiment with this table.
[https://sqlbolt.com/lesson/select_queries_with_outer_joins](https://sqlbolt.com/lesson/select_queries_with_outer_joins)

The actual exercises on that page are different (and you do not need to be able to do them), but you can use the practice area to test your query.