Please type/write up your answers to the following questions, and upload as a pdf file.

**Q1: We discussed four reasons for processes to cooperate. State and explain two of those.**

Information Sharing as users might be interested in the same piece of information, so it reduces the overhead time cost for cooperating process if they share information

Computation speedup to break up a particular task into subtasks being executed in parallel

Modularity as divide and conquer works most effectively for a system with multiple functions assigned by multiple process

It is convenient as individuals can also work on multiple task simultaneously

**Q2: What are the two main inter-process communication models? State and explain.**

The two main inter-process models (IPC) are shared memory and message passing. Shared memory is a region inside the computer’s memory that is publicly shared by all cooperating processes. This means that the OS needs to remove the limit on one process on accessing another process’s memory, and they are of the same address space in the memory segment. However, Synchronization may be needed as processes are responsible to ensure that both of them are not writing in the same location at the same time.

On the other hand, message passing is the communication that takes place by means of messages exchanged between cooperating processes. This provides a mechanism for processes to communicate and synchronize their actions. Usually, a general message passing facility provides at lease a send and receive operation. Therefore, if two processes wish to communicate, they need to establish a commination link between them and exchange messages using message passing.

**Q3: Assume that two processes are using a shared-memory segment. Explain a scenario in which synchronization is required, and explain a scenario where there is no need for synchronization. (Hint: this was the topic of our last lecture)**

Synchronization is required when the each of the two processes are simultaneously both producers and consumers at the same time. This implies that both of them will read and write on the same memory address at the same time, and will have the issue of race condition as several processes access and manipulate the same data concurrently, and the outcome depends on the order of which the access takes place.

On the other hand, there is no need for synchronisation if one process is strictly a producer and the other is strictly the consumer. This means that only one process can manipulate the same data at one time, and the other one only reads from it.

**Q4: Explain the client-server model of communication.**

The client server model describes the relationship of cooperating processes. The server represents the service provider and generally is always awaiting for incoming requests. In contrast, the clients are service requesters that initiate communication sessions with the server to receive service.

**Q5: Consider the python socket programming using the socket module. What is the difference between SOCK\_DGRAM and SOCK\_STREAM?**

There are two different types of sockets, stream and datagram sockets.

SOCK\_STREAM - Stream (TCP) sockets are reliable and byte stream-oriented, that means connection is first established then data can be transferred.

SOCK\_DGRAM - Datagram (UTP) sockets are unreliable datagram, which means that they are connectionless. This implies that no connection is established first, and each data segment is individually addressed and routed to be sent