Homework 1

1. **Differentiate between asynchronous and synchronous communication. [0.25 marks]**
   a. **Asynchronous communication**: Sender continues immediately after it has submitted its message for transmission. It does not wait for its request to be accepted by the communication middleware or received by the receiver. This is non-blocking communication.
   b. **Synchronous communication**: Sender is blocked until its request is known to be accepted by the communication middleware or received by the receiver. This is blocking communication.
2. **Differentiate between transient and persistent communication. [0.25 marks]**
   a. **Transient Communication**: It is necessary for both the sender and receiver to be executing/present at the time of communication
   b. **Persistent communication**: It is not necessary for both sender and receiver to be executing at the time of communication.
   In persistent communication, the sender can submit the message to the communication middleware and need not wait for the message to be delivered to the receiver. Similarly, the receiver need not be executing at the time of message submission.
3. **Mention all the functions are performed by the client stub in a remote procedure call (RPC)? [0.25 marks]**
   a. The client stub builds the request message (parameter marshaling) and calls the local operating system (client's OS).
   b. The client's OS sends the message to the remote server OS.
   c. When the response comes back from the remote server OS to the client's OS, the client's OS gives the response message to the client stub.
   d. The client stub also unpacks the response and returns it to the client.
4. **Mention all the functions are performed by the server stub in a remote procedure call (RPC)? [0.25 marks]**
   a. The server stub receives the request message from the server OS and unpacks the request parameters and calls the intended function on the server.
   b. The server performs the intended function and returns the result to the server stub.
   c. The server stub packs the result in a message and calls its local OS.
   d. The server's OS sends the message to the client's OS.
5. **What is the role of Interface Definition Language (IDL) in RPC? [0.25 marks]**
   a. An IDL is used to specify interfaces for RPCs which can be compiled to fully generate the client stub and server stubs. This simplifies client-server applications based on RPCs
6. **Mention any two benefits of ZeroMQ over vanilla sockets? [0.25 marks]**
   a. ZeroMQ supports asynchronous communication whereas vanilla sockets support synchronous communication.

    b. ZeroMQ sockets transfer discrete messages while vanilla sockets transfer streams of bytes or discrete datagrams.

    c. ZeroMQ can support many-to-one, one-to-many, many-to-many communication instead of just one-to-one communication in the case of vanilla sockets.

7. **What is the most important difference between ZeroMQ and RabbitMQ? [0.25 marks]**

    a. ZeroMQ supports transient communication (no brokers) whereas RabbitMQ supports persistent communication (using brokers)

8. **What is the role of an exchange in RabbitMQ / AMQP? [0.25 marks]**

    a. An exchange acts as an intermediary between the producers and the queues. A producer contacts an exchange. The exchange then places the producers' messages into one or more queues.