1.

a. What is a server program:

   The server program is program that runs constantly on a server. It is responsible for providing a suitable response to clients that periodically connect to it via various connection protocols such as TCP or UDP

b. What is a client program:

   The client program is a program that runs on an end system which requests and receives services from a server program. It is also the program that initiates the connection with the server.

c. Does a server program request and receive services from a client program:

   No, the server program does not request and receive services from a client because it does not initiate a connection with the client as that is the client's job.

2.

Briefly describe how circuit switching works three good sentences are sufficient:

Circuit switching is used to implement a communication network between two nodes which establish a dedicated channel through the network before communication. There is no sharing of resources and there is a circuit-like guarantee, a good example is the old telephone lines connected by copper wire. The important part of Circuit switching is the call setup before communication to establish the connection. Circuit switching is ideal for data that needs to be transmitted in real-time.

3.

Describe what a protocol is in the context of computer networks:

A protocol is essentially a set of predefined rules and procedures for the transmission of data between two electronic devices in a network. TCP or transmission control protocol is essentially the safer service that provides various control of over a connection such as flow congestion and a reliable transport. UDP is the opposite, it does not require a setup in connection and does not have a connection state or reliability. These protocols are used to provide different methods for transfer of information. Similar to the cover of any post. These protocols are there to ensure a standard for people to use. These standards are created by nationwide or industrywide organizations.

4. purpose and operation of:
    a. HTTP:

       HTTP or hyper text transfer protocol is the Web's application layer protocol. It is used by the client and server models. The client such as a browser which requests or receives and displays web objects uses the HTTP protocol.

       The server such as the Web server sends the web objects in response to the requests also using an HTTP protocol

       HTTP uses TCP the client initiates the connection on a port with the server, the server accepts the connection and then HTTP messages are exchanged until the TCP connection is closed. The server does not maintain information of pasts requests (HTTP is stateless)

       The general form for an HTTP message is:

       A request line containing URL, header lines containing information on language encoding e.t.c. And finally the entire body.
    b. DNS:

       The domain name servers (DNS) are provided to allow computers to access websites by converting the name (e.g. www.whatever.com) to a computer friendly IP address e.g. 219.168.123.11 thereby directing the connection to the correct website. There are multiple DNS servers world wide with a hierarchy from root to local company wide DNS servers. This allows them to be scalable and distributes the processing and avoids failure by being on multiple systems. To prevent root servers from being overloaded, once any DNS server learns mapping it caches it with a timeout (TLL). If the Name host changes their ip, it takes 12-36 hours until it is known world wide as TLL's need to expire. DNS operate by the use of protocol messages "query" and "reply" both with the same format. The message contains 16bit identification, and the same space for flags (query or reply, recursion, authoritative reply). This is followed by fields containing queries, answers, authority and extra info.

5. [10marks *2]
    a. What is DDOS attack:

       DDOS or distributed denial of service attack is an attempt at making online websites or services unavailable by overwhelming it with traffic. However, since 2010 with the exponential growth of networks (Big Data) DDOS attacks have become obsolete, a person is more likely to crash their own computer than fill the traffic capacity a modern network can take. Also with the appearance of captchas and other tools that require people who access websites to solve, unintelligent clones created from DDOS software have become unable to even access the websites in question.

    b. Can DoS-type attacks be used to attack the DNS? What would be the damage if such an attack was successful:

       Dos attack on a DNS is when a compromised machine or user sends a lookup query with a spoofed target IP making the target a recipient of much larger DNS responses. This is not the only type of attack, however the aim is to saturate the network by exhausting the server's bandwidth and capacity thereby preventing actual lookup queries from being replied to thereby making a service unavailable. These attacks are usually targeted on regional DNS servers.