1. Name three scenarios, in which a web search engine such as Google will not index a web page and explain each scenario briefly.

1. Pages secured with a user log-in
    - Pages secured by logins such as online banking websites or academic databases, cannot be index by Google as Google does not have access to these pages.
2. Robots.txt
    - Developers can add Googlebot to their robot.txt to prevent it from being indexed
3. Sites that have a lot of duplicate content
    - Sites that have multiple URLs that return that exact same content while be marked as repetitive or duplicates and won't be indexed by Google.

2. Name three different examples of what an e-business can do when it knows the IP address of a user/visitor. Explain each example briefly.

When an e-business knows a customer's IP it can:

1. Restrict the user's access to specific content due to licensing issues:
    - US Netflix is able to offer more titles than Peru Netflix
2. Targeted advertisement based on geo-location:
    - German users and Irish users will receive different ads on BBC.com
3. Offer personalized content based on previous activity on the site:
    - Youtube will recommend content based on the user's previous activity if they do not have an account by looking at the device's IP

3. You run an e-Business and you want to know if a visitor of your website uses a proxy server. Name three options to find out and explain each option in one sentence.

When an e-business wants to know if a visitor is using a proxy server they can:

1. Compare the current IP with a known list of proxy servers
    - An e-business can find a list of known and popular proxy servers and flag all users that are connection to that site through that specific IP as it is not the user's IP, but the proxy servers.
2. Cross-reference if the user's IP is different from their countries IP
    - If a user registers for their Netflix account in Ireland and is connecting through an American IP, it is likely that they are using a proxy server to spoof their location.

3. Check if there are many different users all connecting with the same IP
    - If multiple users are all using the same proxy server they will all be connecting to the server via the same IP, which can be detected then they send their first request.

4. Explain the role of TTL (Time-to-Live) in a traceroute, and how reliable a traceroute is. Feel free to draw an illustration.

Every data packet on the Internet has a time-to-live (TTL) value. TTL is the number of servers/hops it may pass before the packet dies. Whenever a data packet reaches a new hop, the hop deducts 1 from the current TTL and sends the package to the next hop. Once TTL hits 0, the current server returns an error to the origins IP. Traceroute sends a request with a TTL of 1, then 2, then 3 to find the route that the packet is going. Traceroute is not reliable in showing the true path as the routes are not static and may change due to load balancing or when a node goes down.

5. Explain what a "salted hash is" and what it can be used for.

A salted hash is a method that e-businesses can use to prevent pre-computed hash attacks. Many e-businesses use hashes so that they do not need to store their passwords in plain text, however, attackers can use hashing algorithms to pre-compute the hashes of popular passwords or users that use the same password on multiple sires. A salted hash uses a “salt” to add random data as an additional input to the hashing function to safeguard password storage. Because the salt is random and unique to that password, attackers are unable to pre-compute the hash of a password.

6. Explain briefly what DTD and XSD are and name three differences between them.

XSD (XML Schema Definition) is a way to formally describe the elements in an XML document. An XSD document can be used to specify how the data will look like in XML, validate an XML document, or automatically create a java class. DTD (Document Type Definition) defines the structure and the legal elements and attributes of an XML document. Three main differences between them are:

1. DTD’s are derived from SGML syntax while XSDs are written in XML
2. DTD doesn’t support datatypes while XSD supports data types for elements and attributes
3. DTD does not support namespace while XSD supports it

7. Look at the following XML and XSLT. Draw how the complete web page would approximately look in a web browser. If you believe that the XML or XSLT is invalid or not well-formed, provide a brief explanation instead of drawing. Tip: Look carefully at the code.

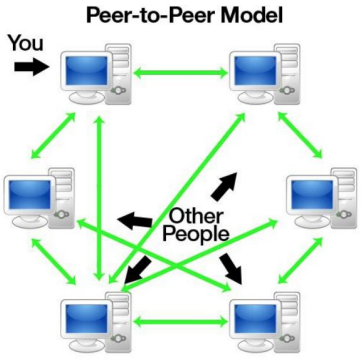
8. A company owns a big collection of movies and has a catalog with all the metadata for the movies (title, year, ...). The company provides an API via a REST Web Service to enable third parties to retrieve information about those movies. For instance, GET HTTP://rest.company.com/movies/$movie_id/ retrieves all metadata about a particular movie with the id movie_id. The company wants to allow third parties to delete movies via the Web Service. What HTTP command and which URL should the company use to allow third parties to delete entire movies? Name the HTTP command, the URL and explain briefly. If you believe there are different options, name them and explain briefly, which one would be best.

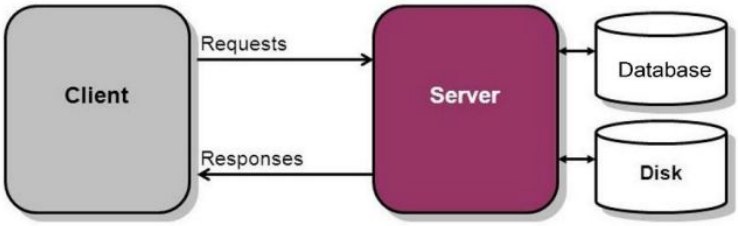
DELETE HTTP://rest.company.com/movies/$movie_id

A company can use the DELETE HTTP method to allow users of their service to delete movies via their web service. DELETE is an idempotent and non-safe method as it is able modifies resources within the service and is able to be called multiple times with the same result. DELETE is idempotent because the first call deletes the resource while subsequent calls return a 404.

10. Explain in less than 300 words a) what a peer-to-peer architecture is, b) how it differs from a client-server architecture and c) why Spotify may have decided to originally use a peer-to-peer architecture but later changed to a server-client architecture. Feel free to draw an illustration for part a) and b).

Peer-to-Peer (P2P) is a distributed application architecture that partitions tasks between peers instead of a central server. The following illustration shows a P2P network and traditional server-client architecture:





P2P differs from a server-client model as there is no “bottleneck” or central server that each user must connect to. Furthermore, every user in the P2P model is equally privileged as they all most connect to each other to create the P2P architecture. Spotify might have originally choose to use a P2P network as their music streaming service need not require very low latency or high bandwidth, making the usually cheaper 2P2 architecture more attractive. However, as their service got larger they switched to a server-client for their desktop app as they were able to establish more servers across the world so that their users could experience faster streaming.

11. The following source code shows an implementation of an echo server. Explain briefly if the code would probably compile and the server would and/or what problems are (if there are any). Please note, this is not about finding minor errors such as missing semicolons or brackets or the name of methods and classes. This is about the major components and concepts behind an Echo server and its implementation.

I believe that this code will fail to compile as the ServerSocket object does not have a constructor that accepts both an integer and a string.

```
serverSocket = new ServerSocket(serverHostname, port):
```

This line will cause the program to fail to compile as it is unable to create the ServerSocket object.