CS 335, Assignment 2
(Please submit your answers in a single PDF file using UR Courses)

**NOTE: The objective of this assignment is that you study the textbook and the slides, and then answer the questions below yourself. You SHOULD NOT simply copy and paste the answers from the textbook or from the slides.

Total = 56
1. (i) [5] List five Internet applications and the application layer protocols that they use.
(ii) [2] For a communication session between a pair of processes, which process is the client and which is the server?
(iii) [2] What information is used by a process running on a host to identify a process running on another host?
(iv) [2] Which two things the application layer can access from the transport layer?
(v) [2] Give the range of the possible port numbers.

2. (i) [3] Consider an HTTP client that wants to retrieve a web document at a given URL. The IP address of the HTTP server is initially unknown. What transport and application layer protocols besides HTTP are needed in this scenario?
(ii) [5] Given the following HTTP request message:
```
GET /docs/index.html HTTP/1.1
Host: www.nowhere123.com
Accept: image/gif, image/jpeg, */*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
Connection:keep-alive
```
  (a) What is the URL of the document requested by the browser?
  (b) What version of HTTP is the browser running?
  (c) Does the browser request a non-persistent or a persistent connection?
  (d) What is the IP address of the host on which the browser is running?
  (e) What type of browser initiates this message?
(iii) [5] Write the purposes of the following HTTP request methods: GET, POST, HEAD, PUT and DELETE .

3. (i) [3] List the three basic components of E-Mail.
(ii) [2] What differences there are between SMTP and HTTP.
(iii) [5] Suppose Alice, with a Web-based email account (such as Hotmail or Gmail), sends a message to Bob, who assesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application layer protocols that are used to move the message between the two hosts.

4. (i) [4] Find the IP address to the corresponding hostnames: www.amazon.com, www.amazon.ca, www.ilpt20.com, www.uregina.ca

(ii) [2] Write any two services that a DNS server provides.

(iii) [4] Describe how a host "A" obtains the IP address of a corresponding hostname "B", given the local DNS server and the DNS server hierarchy.

5. [10] Suppose distributing a file of F = 15 Gbits to N peers. The server has an upload rate of u_s= 30 Mbps, and each peer has a download rate of d_i = 2Mbps and an upload rate of u. For N = 10, 100, and 1000 and u = 300 Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution. (Hints: 300Kbps = 300/1024 Mbps.)