**OLLSCOIL NA hEIREANN, CORCAIGH**
THE NATIONAL UNIVERSITY OF IRELAND, CORK

**COLAISTE NA hOLLSCOILE, CORCAIGH**
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**Autumn Examinations 2015**

# CS2505 – Network Computing

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Answer all Questions.
Total Marks 80

1.5 hours

The use of electronic calculators is permitted.
Please clearly label your answer to each question and sub-question.

**PLEASE DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO**

**ENSURE THAT YOU HAVE THE CORRECT EXAM PAPER**

**Question 1: General Networking Concepts [20 marks]**

a) For each sub-question below answer either *True* or *False*. *[10 marks]*

i. Link bandwidth is usually measured in milliseconds.

ii. HTTP is an example of a request-response protocol.

iii. DSL typically offers asymmetric bandwidth.

iv. A "bottleneck" link constrains the achievable end-to-end throughput.

v. The OSI network architecture is based on a 6-layer model.

b) Copy the following table into your answer book, then draw links from the items listed on the left to the items listed on the right in order to show the correct associations. *[10 marks]*

| | | |
|---|---|---|
| *Web browsing* | | *IMAP* |
| *Email access* | | *BitTorrent* |
| *File sharing* | | *HTTP* |
| *Reliable transport* | | *DNS* |
| *Name resolution* | | *TCP* |

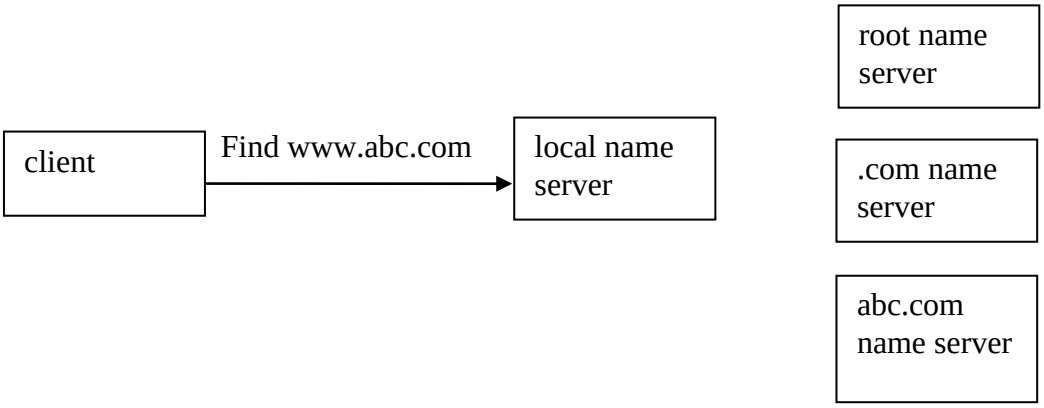
**Question 2: Networking Fundamentals [20 marks]**

a) Draw one or more diagrams as needed to show the general structure of the Internet. Use labels to highlight the edge and core of the Internet, and the concept of a tiered "network of networks". *[10 marks]*

b) Suppose a 1Mb/s link is being set up between the earth and a new lunar colony. The distance from the moon to the earth is approximately 386,000 kilometres and data travels over the link at the speed of light – 300,000 kilometres per second. How long does it take to transfer a 500KByte file from the Moon to the Earth? Assume that in order to request a file from the Moon requires an initial 2*RTT of "handshaking" before the file can be transmitted. *[10 marks]*

**Question 3: Application Layer [20 marks]**

a) Copy the following figure into your answer book twice and use it to explain how the name of host www.abc.com is resolved to its corresponding IP address using both iterated and recursive modes. Be sure to give sufficient detail in your answer to explain what actions are taken at each step of the process you describe. *[10 marks]*




*b*) Using a labeled diagram, show the basic operation of a playout buffer in a video streaming client. *[4 marks]*
When streaming video it sometimes happens that the playback stalls because the local client buffer is empty. Briefly describe two ways that stalls can be avoided? *[6 marks]*

**Question 4: Transport Layer [20 marks]**

*a)* Explain the purpose of the *port* field in Internet transport protocol headers. Illustrate using an example. *[5 marks]*
Justify why an application programmer might decide to use UDP rather than TCP? Consider all performance-related factors that impact this decision. *[5 marks]*

*b)* TCP uses a sliding-window protocol. Consider two hosts, A and B, with an open TCP session. A sends a segment with sequence number 2600 and after some time receives a segment from B with sequence number 22500 and acknowledgment number 3600 and Receive/Advertised Window set to 10000.

*i)* How many bytes were received and confirmed by host B? *[4 marks]*
*ii)* Is there a relationship between the values of the two sequence numbers? Explain your answer. *[4 marks]*
*iii)* How will host A interpret the value of the Receive/Advertised Window field?*[2 marks]*