

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

**COLAISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK**

**Autumn Examination 2009
Second Science**

**Computer Science
CS2204 – Network Computing**

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You may use a calculator.
Attempt all four questions.

Time allowed: 3 hours

Question 1: General Concepts [20 marks]

Each sub-question below is worth 2 marks. Answer either *True* or *False* in each case.

- a) The Internet Protocol (IP) is an application –layer protocol.
- b) OSPF is a routing protocol.
- c) Border Gateway Protocol (BGP) runs on end-host devices like PCs and printers.
- d) IPv6 addresses are 64-bits in length.
- e) UDP provides reliable message delivery.
- f) HTTP uses TCP as its underlying transport protocol.
- g) DNS stands for Domain Name System.
- h) The ping command is implemented using DHCP.
- i) TCP provides flow control.
- j) When using symmetric key cryptography the sender and receiver keys are identical.

Question 2: Packet Switching & Internetworking [40 marks]

- a) Explain the basic principles of datagram packet switching as used in the Internet. [5 marks]
 Identify the steps that are taken by an IP router in processing a newly arrived packet. (*Hint: think about all the main fields in the IP header and what they are used for*). [10 marks]
- b) Using an example, explain the motivation for using classless IP addressing instead of class-based IP addressing. [4 marks]
 For the address 192.1.23.0/24, identify the subnet address. [3 marks]
 State how many unique *hosts* can be identified using this address? [3 marks]
- c) Expand the acronym DHCP. [5 marks]
 State briefly the purpose of using DHCP. [5 marks]
 When allocating dynamic addresses, what mechanism is used by DHCP to deal with reclaiming addresses from hosts that become disconnected or crash? [5 marks]

Question 3: End-to-End Protocols [40 marks]

- a) Draw a simple diagram showing a bus-style Ethernet network and a token-ring network connected by a router. Show a computer attached to each of the two networks [4 marks].
 Show the protocol stack that is used on both the computers and the protocol stack that is used on the router. Assume that one computer runs a web server and the other runs a web browser [6 marks].
- b) The figure below shows the TCP header (without options). For each field briefly explain how its value is determined *and* how it is used. [15 marks]

0	4	10	16	31
SrcPort		DstPort		
SequenceNum				
Acknowledgment				
HdrLen	0	Flags	AdvertisedWindow	
Checksum			UrgPtr	

- c) Suppose if a user clicks on a link using a web browser that it will result in the download of a HTML file corresponding to the link's URL. Further suppose that the HTML file lists two small image files on the same server, and that these two image files are then downloaded by the browser immediately after receiving the initial HTML file. Show *using a time sequence diagram* the complete set of messages that are exchanged between the client and server, firstly to establish the TCP connection, then to download the HTML and image files. Assume the simplest case – no parallel TCP connections, no persistent TCP or pipelining, and no packet losses. [15 marks]

Question 4: Services & Security [40 marks]

- a) Explain the sequence of steps that take place in order to map a host name to an IP address, for example when you enter *www.comany.com* into a web browser. Be sure to clearly identify which Internet services/protocols are involved. *[8 marks]*
At the link level, what protocol is used to map an IP address to a link-layer address, e.g. an Ethernet address? Explain why this mapping is necessary. *[7 marks]*
- b) Explain the five aspects of network management defined in the ISO Network Management Model. *[5 marks]*
Under what circumstances is an SNMP TRAP message used? Illustrate its operation using a diagram. *[5 marks]*
- c) In relation to message security, explain the concept of a message digest and how it is used to ensure message integrity. *[10 marks]*
Discuss whether Internet Checksum would make a suitable choice as a hashing algorithm for producing a message digest. *[5 marks]*