

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

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

**Summer 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]**

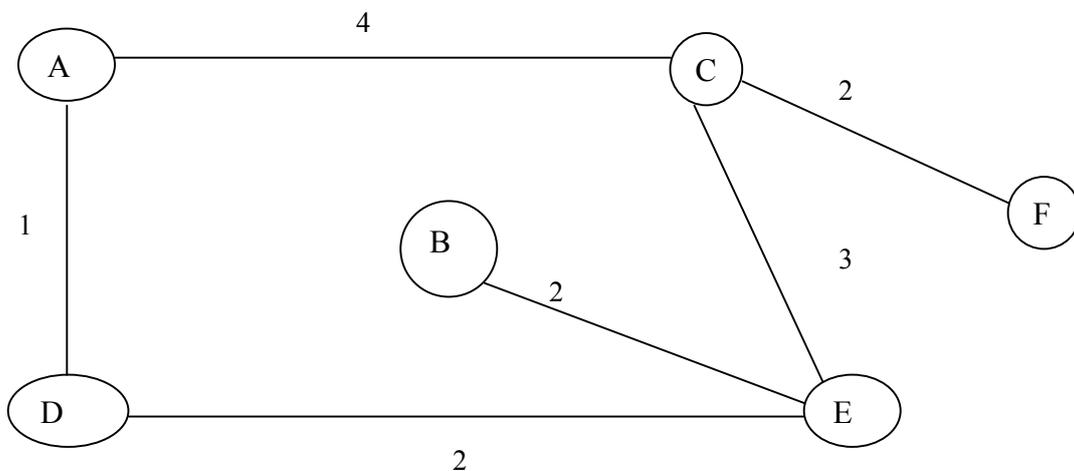
Each sub-question below is worth 2 marks. Answer either *True* or *False* in each case.

- a) The Internet Protocol (IP) is a transport –layer protocol.
- b) The RIP routing protocol is based in the Distance-Vector algorithm.
- c) Network address translation (NAT) is functionally equivalent to the Address Resolution Protocol (ARP).
- d) IPv6 addresses are 128-bits in length.
- e) UDP does not provide flow control.
- f) HTTP uses TCP as its underlying transport protocol.
- g) A DNS server can map host names to geographic coordinates.
- h) DHCP stands for Dynamic Host Configuration Protocol.
- i) TCP uses the sliding window mechanism to achieve flow control.
- j) When using asymmetric key cryptography the sender and receiver keys are the same.

**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 main steps that are taken by an IP router in processing a newly arrived packet. (Hint: think about the main fields in the IP header and what they are used for). [10 marks]

- b) For the network given in the figure below, you are asked to show the sequence of steps in populating the global Distance-Vector routing table. Confirm that the initial table as provided is correct and use it as a starting point. [15 marks]



From Node	(Distance) To Node					
	A	B	C	D	E	F
A	0	∞	4	1	∞	∞
B	∞	0	∞	∞	2	∞
C	4	∞	0	∞	3	2
D	1	∞	∞	0	2	∞
E	∞	2	3	2	0	∞
F	∞	∞	2	∞	∞	0

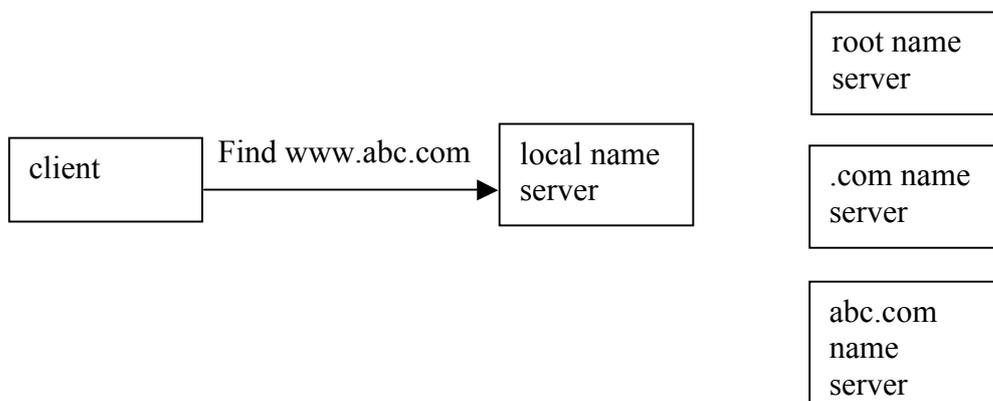
- c) Explain why IPv4 performs fragmentation. Why is reassembly performed only at the destination rather than at intermediate routers? How does the destination know if there are missing fragments? [10 marks]

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

- a) List the application-layer protocol, the transport-layer protocol and the network-layer protocol that are used by file transfer clients and servers. [6 marks].  
Draw a diagram showing the sequence of headers in a packet as it would be sent from a file transfer client to a file transfer server. [4 marks].  
Explain the purpose of the port field in Internet transport protocol headers. [5 marks].
- b) 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. For each of the cases below, calculate *using time sequence diagrams* the number of round trip times (RTTs) that elapse from when the user clicks on the URL to when the download of all *three* files is complete. Only consider delays due to TCP and HTTP exchanges. Assume that each object can fit in a single TCP segment and that there are no packet losses. For simplicity assume that to open and close a TCP connection requires a total of 3 RTTs. [15marks]
- i) Nonpersistent HTTP with no parallel TCP connections.
  - ii) Nonpersistent HTTP with parallel TCP connections.
  - iii) Persistent HTTP with no pipelining.
  - iv) Persistent HTTP with pipelining.
- c) Video conferencing applications encode and packetise video and voice for delivery between computers on the Internet. The bandwidth required is relatively high and because users interact in real-time a low latency is desirable. Given the choice of TCP or UDP as transport protocol, which would you recommend for these applications and why? (*Hint: think about issues such as reliability, latency, congestion*) [10 marks]

### Question 4: Services & Security [40 marks]

- a) Expand the acronym DNS. Copy the following figure into your answer book and use it to explain how the name of host [www.abc.com](http://www.abc.com) is resolved to its corresponding IP address. [15 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) Three common network security threats are (i) packet sniffing, (ii) packet spoofing, and (iii) denial of service. Explain the nature of these three threats, how they can be implemented, and show some steps that can be taken as countermeasures. *[15 marks]*