

Candidates are admitted to the examination room ten minutes before the start of the examination. On admission to the examination room, you are permitted to acquaint yourself with the instructions below and to read the question paper.

Do not write anything until the invigilator informs you that you may start the examination. You will be given five minutes at the end of the examination to complete the front of any answer books used.

May/June 2012

SE3CN11 2011/12 A 001

1 Answer Book
Calculators not permitted

UNIVERSITY OF READING

COMPUTER NETWORKING (SE3CN11)

Two hours

Answer **THREE** questions.

1.
 - (a) The Internet is moving from IPv4 to IPv6. Describe the impact this will have (if any) on the Application Layer, Transport Layer, Network Layer and Data Link Layer, and the devices at the network edge and network core. (5 marks)
 - (b) Describe FOUR key features of IPv6 and discuss their advantages over IPv4. (5 marks)
 - (c) Packet Fragmentation in IPv4 and IPv6 is performed very differently. Describe how the TWO protocols handle fragmentation. Why is the IPv6 approach so different, and what advantages and disadvantages does it have over the IPv4 approach on today's Internet? (15 marks)
2.
 - (a) TCP/IP uses end-end congestion control, which is very different from ATM's network-assisted congestion control approach. Describe how TCP/IP is able to infer network congestion and discuss why this is the approach chosen by the designers of TCP/IP, rather than the network-assisted approach chosen for ATM. (5 marks)
 - (b) The requirements of the application layer and the properties of the underlying physical layer determine the functions of the transport layer. Discuss why this is the case and give examples of the functions that a transport layer protocol needs to support email over a WiFi connection. (5 marks)
 - (c) Describe with the aid of a diagram how TCP's slow start congestion control algorithm interacted badly with HTTP 1.0. What would be the impact of using TCP over a wireless network, which typically experiences multiple losses? Explain your answer fully. (15 marks)

3. (a) Why has IP's original Classfull addressing scheme led to the rapid depletion of IP addresses? How has Network Address Translation helped overcome this problem for the short-term? (5 marks)
- (b) Describe how Network Address Translation (NAT) makes the Internet more vulnerable, can reduce performance in a network, and interferes with the operation of P2P applications. (5 marks)
- (c) A UDP socket is identified by a 2-tuple, whereas a TCP socket is identified by a 4-tuple.
- (i) Describe the data contained within a UDP socket's 2-tuple and a TCP socket's 4-tuple.
- (ii) Why do TCP sockets need to be identified by a 4-tuple when UDP sockets only need a 2-tuple? Explain your answer in terms of the connection-oriented and connectionless nature of TCP and UDP, respectively, and the effect each approach has on the operation of a server. (15 marks)

4. (a) Ethernet can detect if a frame has become corrupted during transmission. Using your knowledge of the service Ethernet provides to the network layer above it, describe the effects of a corrupted Ethernet frame on the network layer, transport layer and application layer, if the application is using TCP. (5 marks)
- (b) Describe the difference between Hubs, Routers and Switches, focusing on each device's role in its respective layer (ignore hybrid devices such as switching routers). (5 marks)
- (c) Suppose you take your laptop to University with you and with it, connect to the University's WLAN. Once connected, you use your laptop's Web browser to visit a Web page hosted on a server on an external network.

Describe the steps needed to achieve this. In particular, describe how your laptop first obtains an IP address, how it is able to reach the wider Internet via the WLAN, and how the Web page request is able to find its way to the Web server.

You should include descriptions of how the protocols involved in this process work to enable your laptop to communicate with the Web server across networks.

(Note: you do not need to include descriptions of IP routing protocols) (15 marks)

(End of Question Paper)