On admission to the examination room, you should acquaint yourself with the instructions below. You must listen carefully to all instructions given by the invigilators. You may read the question paper, but must 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 2015 **SE3CN11 2014/15 A 001**

1 Answer Book
Any calculator (including programmable calculator) permitted

UNIVERSITY OF READING

COMPUTER NETWORKING (SE3CN11)

Two hours

Answer any **THREE** out of FOUR questions.

EACH Question is 20 marks.

1. (a) Describe with an example how the tit-for-tat scheme in BitTorrent gives faster file downloads to altruistic peers.

(4 marks)

(b) Describe why Iterated Querying of the Domain Naming System (DNS) can theoretically reduce the load on the Root DNS Server by half compared to Recursive Querying. How can caching employed throughout DNS overcome this problem?

(4 marks)

(c) Describe with the aid of a diagram how TCP's congestion control algorithm interacted badly with HTTP 1.0. How has HTTP 1.1's use of persistence and pipelining improved performance?

(12 marks)

2. (a) 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 needed in a transport layer that can support video conferencing over a fibre optic connection. (4 marks)

(b) The Internet can be thought of as all the computer and network devices that are connected to each other and that support TCP/IP. Which of these devices does IP run on? Describe the services that IP is responsible for, and explain the reason for this architectural design. (4 marks)

(c) BitTorrent is an extremely efficient protocol for transferring large volumes of data across a transport service. Describe how BitTorrent works, including the application requirements it has on the transport service. What makes BitTorrent such an efficient protocol? (12 marks)

3. (a) Suppose you create a home network by connecting a wireless router to your cable modem. Also suppose that your ISP dynamically assigns your wireless router one IP address. You then connect five PCs at home to your wireless router using WLAN. How are IP addresses assigned to the five PCs? Does the wireless router use NAT? Describe your answer in full.

(4 marks)

(b) Complete the values of the sequence numbers, ACK numbers, and receiver windows in the segments shown in Figure Q3. Describe what would happen after the receiver received the last segment (i.e. the segment with Seq=200). Can the sender send more segments, and if not, what would need to happen before it could?

(4 marks)

(c) Suppose you take your smartphone to work with you and with it, connect to your work's WLAN. Once connected, you use your smartphone'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 smartphone 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 smartphone to communicate with the Web server across networks.

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

(12 marks)

(Question continues on next page)

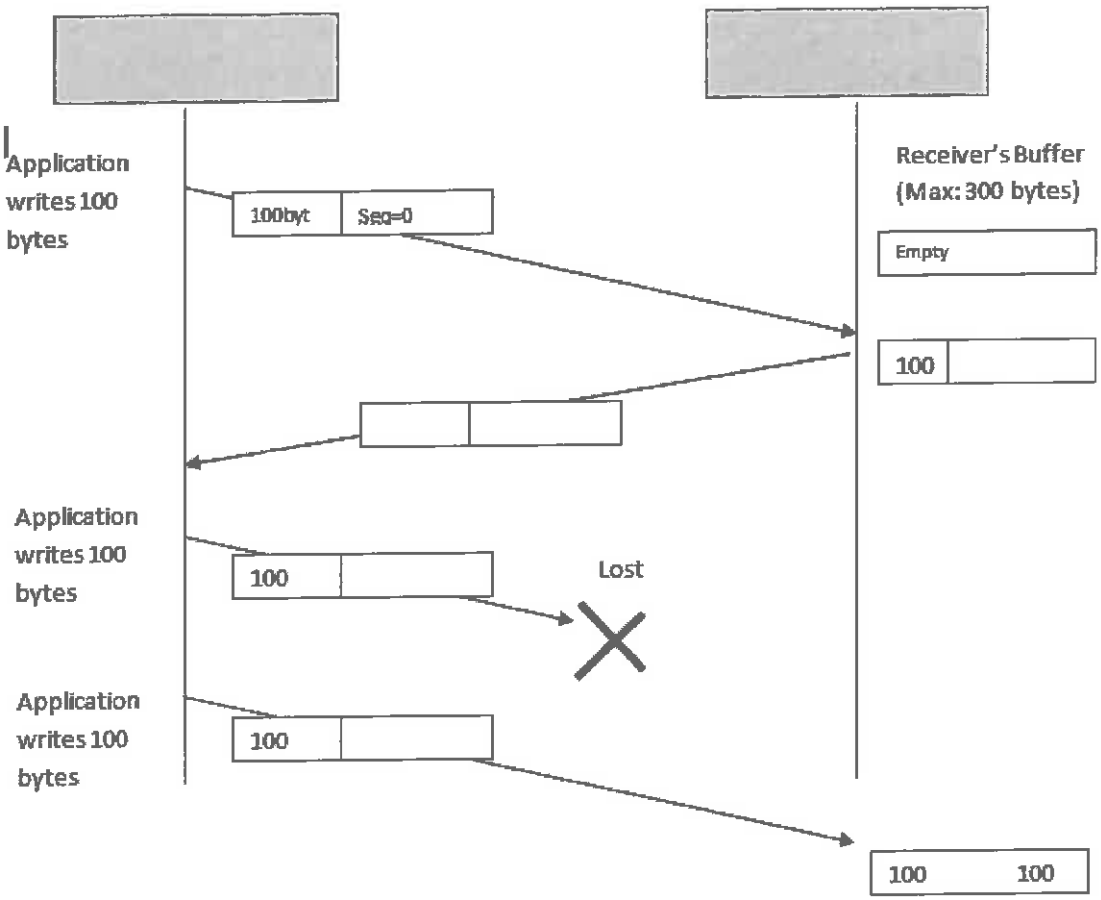
Application writes 100 bytes
100byt
Seq=0
Receiver's Buffer (Max: 300 bytes)
Empty
100
Application writes 100 bytes
100
Lost
Application writes 100 bytes
100
100
100

Figure Q3.

4. (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. (4 marks)

(b) Describe four key features of IPv6 and discuss their advantages over IPv4. (4 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?

(12 marks)

(End of Question Paper)