

2010 Exam Autumn [Network Computing]

Question 1: General Networking Concepts [10 marks]

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

- a) **TCP provides reliable delivery.**
 - True

- b) **Congestion is said to occur when queues in routers overflow.**
 - True

- c) **The software implementing the DNS Domain Name Service is executed on Internet routers.**
 - False

- d) **HTTP uses binary rather than text to encode its messages.**
 - False

- e) **The Internet is based on the principle of packet switching.**
 - True

Question 2: Networking Fundamentals [20 marks]

- a) **What are the five layers of the Internet protocol architecture? List the principal responsibilities of each layer. [10 marks]**
 - Applications: supporting network applications: FTP, SMTP, HTTP
 - Transport: process-process data transfer: TCP, UDP
 - Network: routing of datagram's from source to destination: IP, routing protocols
 - Link: data transfer between neighbouring network elements: PPP, Ethernet
 - Physical: bits "on the wire"

- b) **Consider a 50Kb/s link to an interplanetary spacecraft. The distance to the spacecraft is approximately 2,232,000 miles and data travels over the link at the speed of light – 186,000 miles per second. The spacecraft takes a photo that is compressed to size 500Kbytes. How long does it take for the photo to be delivered over the link? [10 marks]**
 - $2,232,000 / 186,000 = 12\text{seconds}$
 - $500\text{Kbytes} \times 8 = 4,000\text{Kbits}$
 - $4,000 / 50\text{kb/sec} = 80\text{seconds}$
 - $80(\text{Transmission Delay}) + 12(\text{Propagation}) = 92\text{seconds}$

Question 3: Application Layer [20 marks]

- a) **Draw a diagram showing (in their correct sequence) the four protocol headers in a packet as it would be sent across an Ethernet link to a file transfer server, having traversed the Internet from a file transfer client. [4 marks]**
 - FTP – Application Layer

- **Checksum:** This makes sure that there were no bit errors since the file was sent. This value is calculated by the one's complement addition of 16-bit binary values representing the data in the segment.
- **Urgent Pointer:** Points to the location of urgent data. If the urgent flag is set then there is urgent data.

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.

i) How many bytes were received and confirmed by host B? [4 marks]

- The total number of bytes received and confirmed by the host B is the ACK number – the sequence number first sent by A eg. $3600 - 2600 = 1000$ bytes.

ii) Is there a relationship between the values of the two sequence numbers? Explain your answer. [4 marks]

- No there is no relationship between the sequence numbers as they are just randomly generated on each machine where the TCP connection is started and the sequence number is only used on the other machine as an ACK.