

2009 – Exam Autumn [Network Computing]

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.
 - False

- b) IPv6 addresses are 64-bits in length.
 - False

- c) UDP provides reliable message delivery.
 - False

- d) HTTP uses TCP as its underlying transport protocol.
 - True

- e) DNS stands for Domain Name System.
 - True

- f) TCP provides flow control.
 - True

Question 2: Packet Switching & Internetworking [40 marks]

- a) Explain the basic principles of datagram packet switching as used in the Internet. [5 marks]

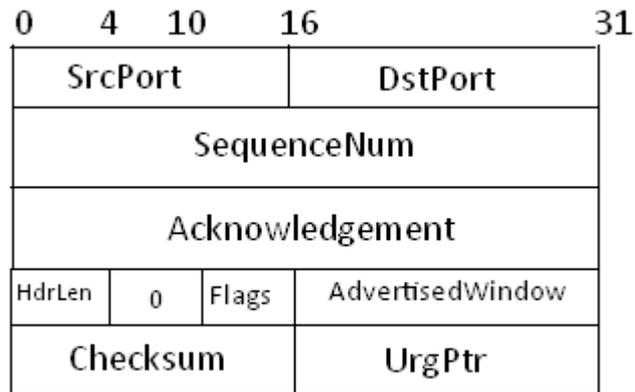
- Packet Switching is a digital networking communications method that groups all transmitted data – regardless of content, type, or structure – into suitably-sized blocks, called *packets*. Packet switching features delivery of variable-bit-rate data streams (sequences of packets) over a shared network. When traversing network adapters, switches, routers and other network nodes, packets are buffered and queued, resulting in variable delay and throughput depending on the traffic load in the network.

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]

- If the buffer is full, the packet will be discarded.
- First of all, the router makes sure that there are no bit errors using the checksum.
- It then looks at the IP and determines the link to send the packet on.

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

- a) 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]



- **Source Port:** Defines the port from which the datagram was received. Value is assigned by the operating system.
- **Destination Port:** Defines the port to which the datagram received will be sent. Value is assigned by the operating system.
- **Sequence Number:** Number of the first byte contained in the datagram in the byte stream. During connection establishment both communicating hosts reveal their initial sequence number.
- **Acknowledgement:** TCP uses cumulative acknowledgements. The value of the acknowledgement is the next sequence number the host is expecting. Acknowledgement number – 1, is the last byte that the acknowledging host has received in order.
- **Header Length:** This is the amount of bytes the header contains.
- **Advertised Window:** This is used for flow control. The value is determined by the amount of free space in the buffer.
- **Flags:** Flags reveal information about the segment. Such as if this segment is an acknowledgement segment, is there urgent data in the segment and is this a handshaking segment.
- **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.