ELEX 4550 : Wide Area Networks
Term 201410

FINAL EXAMINATION
SW1-3005
10:30 – 13:30 AM
Thursday, May 22, 2014

This exam has seven (7) questions on two (2) pages. The marks for each question are as indicated. There are a total of 24 marks. Answer all questions. Show your work. Numerical answers must include units. You may answer the questions in any order. Books, notes and calculators are allowed. You may keep this exam paper. Show your work. **Write your answers *only* in the exam book provided**.
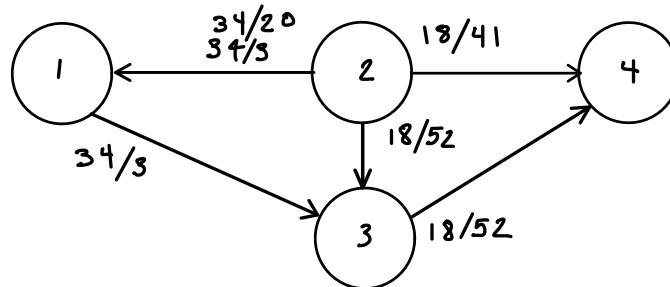
Question 1 (3 marks)

A PON uses 1:8 splitters. The OLT transmit power is 0 dBm, and receiver sensitivity is -24 dBm. The cable loss is 0.3 dB/km.

Assume the splitters are ideal and an additional loss of 9 dB must be assumed for connector losses and margin.

 (a) Assuming all of the losses and margins above, what is the received signal level for a zero-length link?

 (b) What is the maximum link length?

Question 2 (3 marks)

The diagram below shows an ATM network with four switches. Each outgoing link is labelled with the VPI/VCI pairs (in that syntax, with values in decimal) that cause frames to be forwarded out that link. None of the ATM switches alters the VPI/VCI values.

An ATM frame starting with the four header bytes 0x01 0x20 0x03 0x42 arrives at switch 2.

 (a) what are the VPI and VCI values (in decimal)?

 (b) what path would the ATM cell follow through this network?

Question 3 (3 marks)

Give the byte values in hex of the PPP encapsulation of a packet consisting of the two bytes: 0x7d 0x10. Use a protocol value of 0x11, a CRC value of 0x1234 and no padding. Show all bytes including the starting and ending flags.

Question 4 (3 marks)

For each of the following answers give (i) the number of bytes and the (ii) the byte values *in hexadecimal*.

(a) What are the values of the TTL and destination address fields in the IP header of the first packet generated by the command: `traceroute 160.16.0.1`.

(b) What is the value of the protocol field in the IP header received in response?

Question 5 (2 marks)

A TCP connection is set up to an HTTP server and a web page is retrieved. The client decides it does not need to send another request. (a) What flag bit(s) will be set in the packet sent to the server? (b) What flag bit(s) will be set in the response(s) from the server?

Question 6 (4 marks)

An HTTP server sends a response that consists of only an OK response, one header line giving the Content-Type and one line of HTML. The protocol is HTTP version 1.1 The content type is text/html. The HTML line is the single word `Hello` with markup that causes it to be displayed in a bold font.

Show the server's response. Number each line.

Question 7 (6 marks)

For each description in the first column give the acronym in the second column that best matches. There is only one best-matching acronym per description. No marks deducted for incorrect answers.

(a)	uses optical nodes	PDH
(b)	uses optical splitters	POTS
(c)	uses call-progress tones	DNS
(d)	upstream and downstream operate at different rates	ADSL
(e)	carries TV signals	ICMP
(f)	uses T1 and T3	IP
(g)	uses rings for redundancy	HFC
(h)	uses MAP frames to allocate upstream time slots	DHCP
(i)	is a network-layer protocol	DOCSIS
(j)	supplies IP address	PON
(k)	supplies netmask value	SONET
(l)	used mainly by network administrators	CATV