

Assignment 3

Due Monday May 4. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

What is the data rate of an OC-12 SONET signal? What is the frame rate? How many section, line and path overhead bytes are transmitted per frame? What percentage of the overall data rate is devoted to overhead?

Question 2

The values of the H1-H2 bytes in an STS-3 SONET signal are observed to increment (increase by one) once per second. What is the difference between the payload clock rate and the SONET clock rate in ppm?

Question 3

How does an ATM receiver determine the last ATM frame of a packet transmitted using AAL5?

How many padding bytes are included in the last ATM frame of an AAL5-encapsulated IP packet whose "Total Length" field (bytes 16-31) has the value 512?

Question 4

How many endpoints can there be in an ATM network if the VPI/VCI values do not change as frames traverse the ATM network? How many devices can there be in the network if the VPI/VCI values are "swapped" at each switch?

Question 5

In general, can a subscriber determine the final destination of an ATM frame by looking at the VPI/VCI values of outgoing frames? Why or why not?

Question 6

The payload (information field) of a PPP frame contains 256 bytes consisting of one byte with every value between 0x00 and 0xff. What is the total length of the PPP frame, including the starting and ending flag bytes? Assume the protocol value is 0x00, a 16-byte FCS is used and no padding is required.

Question 7

Would the use of a 16-bit vs 32-bit CRC on a PPP connection be negotiated by the LCP, NCP or neither? Provide proof.

Question 8

- (a) Which of the 32-bit IP header words contains the TCP SYN flag?
- (b) If the first byte of an IP packet is 0x47, what is the length of the option field in bytes?
- (c) What is the minimum value of the TTL field in a received IP packet? Why?
- (d) Which of the following protocols could appear in the protocol field of an IP packet: PPP, TCP, HTTP, ICMP, NCP?

Question 9

Use ARIN.net to look up the IP network starting at 104.237.160.0. Who is this address space assigned to? How would this network be written in CIDR notation? Using a netmask?

Is the address 104.237.224.18 in this network?

Question 10

Identify the type of network that each of the following IP addresses belongs to:

- (a) 192.168.192.168
- (b) 169.254.250.1
- (c) 142.232.18.19
- (d) 238.11.6.8

Question 11

A router contains the following entries in its routing table:

Destination	Netmask	Metric	Interface
76.09.0.0	255.255.128.0	2	76.09.83.1
76.09.0.0	255.255.128.0	1	76.09.83.16
76.09.134.0	255.255.255.0	1	76.09.83.16
0.0.0.0	0.0.0.0	0	192.168.0.1

How would each of the following frames get routed?

- (a) 76.09.0.1
- (b) 76.09.128.45
- (c) 76.09.134.37

Question 12

A DHCP OFFER message has the value 0x12345678 at offset 20 (bytes) into the DHCP payload. What is the significance of this value?

Question 13

Other than the End tag, what option(s) must always be included in a DHCP packet?

Question 14

Give the values of the bytes (in hex) that would be used to encode a DHCP option with a type value of 11 (decimal) and a value consisting of the string equal to your common name (e.g. Bob).

Question 15

Show the byte values for TLV field for a DHCP lease time option of one hour. You may have to look at [RFC 1533](#).