# Assignment 3

*Due Tuesday, April 8. 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

For SONET:

(a) Is bit- or byte-oriented framing used?

(b) Why is the frame rate 8 kHz?

(c) What data rate is consumed by bits used only for framing? By bits that enable error rate monitoring?

(d) What fraction of an STS-3 SONET frame, not including path overhead, is overhead rather than payload? What is the overhead fraction for an STS-3c frame?

## Question 2

You are monitoring the frame pointer value on an STS-1 link and notice the frame pointer "wraps around" (returns to its original value) once every 24 hours. What is the frequency offset between the SONET clock and the payload clock, in Hz?

## Question 3

Compute the values of every byte of every ATM cell required to transmit a 100-byte all-zero frame using AAL5-encapsulation. Assume the GFC is zero, VPI/VCI are 50/82, the type and CLP fields are zero (unless they need to be set for AAL5 encapsulation).

You don't need to compute the CRC field values, show these bytes as 0xff. Show padding bytes as 0xaa.

If there are more than four consecutive bytes with the same value show the number of bytes and the value (e.g. 32×0xff), don't write out each value.

## Question 4

A PBX sees a peak call arrival rate PBX of 10 calls/minute of which half need to be connected to trunks (the rest are intra-office calls). The mean call holding time is 4 minutes. Assuming the Erlang-B distribution can be used to compute blocking probability, approximately how many trunks are required to keep the blocking probability below 2 %? You may use an Erlang-B chart to find the solution.

## Question 5

Write the values, in hexadecimal, of the following frame after it has been encapsulated as a PPP frame:

    20 7D 00 7E 7E FF

Use a protocol value of (decimal) 45, no padding, and set the FCS to 0x0000 (two bytes).

## Question 6

Look up RFC 1234. In one sentence, describe the purpose of this RFC.

## Question 7

Show the bytes, in hexadecimal notation, of a 76-byte IPv4 packet that has a source address of 192.168.0.10, destination address of 192.168.0.1, TTL value set to 64, and carries a UDP frame (protocol number 17 decimal). You can show the checksum values as ??. Assume no options and that optional fields are set to zero.
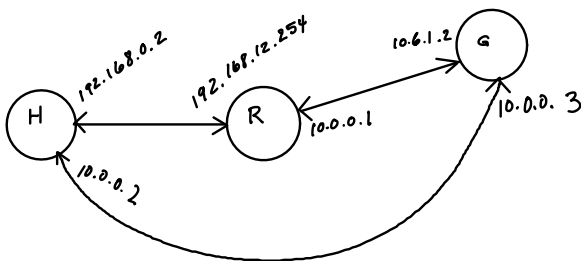
## Question 8

(a) What is the netmask for a /17 network?

(b) A routing table contains the network 123.45.96.0 with netmask 255.255.224.0 How would you write this network's address in CIDR ("slash") notation?

## Question 9

Is the IP address 140.15.205.114 in the 140.14.0.0/15 network? Show your work.

## Question 10

The following network diagram show a simple network.



(a)  (i) Write out the routing table entries for H that will route traffic for the 10.0.0.0/8 network to the interface connected to G and *all* other traffic to R.

 (ii) Write out the routing table entries for R that will route all traffic for the 10.0.0.0/8 network to G, traffic for host 192.168.0.2 to the interface connected to H and all other traffic to G.

 (iii) Write out the routing table entries for G that will route traffic for host 10.0.0.1 to R and traffic for host 10.0.0.2 to H.

Each routing table entry should include the destination network address/netmask (or gateway address for default routes) and the corresponding *interface* IP address.

(b) G has no default route. What would be a reasonable thing for G to do if it receives an IP packet with destination IP address 142.232.15.23? *Hint: Look up ICMP type 3 messages.*