1. Answer:

    a. No, the fabric uses a shared bus, so it is impossible to forward two packets through the fabric at the same time since the shared bus can only support one packet at the same time.

    b. Yes, the fabric using crossbar can forward two packets at the same time, because two packets arrive to two difference input ports and two packets have different destinations, so crossbar can handle them in a way as P –Q and X-Y.

    c. No, if the multiple packets are forwarded to the same port at the same time, it’ s impossible for crossbar to forward them at the same time.

2. Answer:

    a. The input ports, output ports and the switching fabric are implemented in hardware, because they are in data plane, which is implemented in hardware. The input and output port also performs link-layer functions like encapsulation and decapsulation, they also check the forwarding table to identify the next port for the datagram. The switching fabric connects the router’ s input ports to its output ports. Also the software implementation cannot support transfer speed.

    The routing processor is implemented in software, because it is in control plane which is implemented in software. The routing processor need to execute the routing protocols, maintains routing tables and attached link state information, computes the forwarding table. It also performs the

network management functions. These all need to be implemented in software.

b. Packet will also occur if the packets' rate to the single output port exceeds the line speed. For instance, if multiple inputs ports go to the same output port, the queues will get larger and finally exceed the output port buffer, which will lead to packet loss. Increasing the switch fabric spped cannot help here.

c. For each decimal number, the 8-bit binary type are:

   223 – 11011111; 1 – 0000001; 3 – 00000011; 27 – 00011011;

   So the IP addresses 223.1.3.27' s 32-bit binary equivalent is:

   11011111.00000001.00000011.00011011;

3. Answer:

   a. Each router have one forwarding table and two interfaces. Each of the source host and destination host also get a interface.

      So, the total interfaces will be 3*2+2 = 8

      The total forwarding tables are 3.

   b. The DHCP will assign IP addresses to the 5 PCs, and to the router interface.

      DHCP allows a host to automatically get an allocated IP address.

      Yes, the wireless router also uses NAT as it can obtain only one IP address from the ISP

4. Answer:

   Assume (A, B, C) means (top port, middle port, bottom port)

We need two time slots: (X, Y, Z), (0, X, Y)

The worst case we need 3 slots: (X, 0, Z), (0, Y, 0), (0, 0, Y)

5. Answer:

   Any IP address in range 128.119.40.128 to 128.119.40.191. The four equal size:

   128.119.40.64/28,

   128.119.40.80/28,

   128.119.40.96/28,

   128.119.40.112/28:

6. Answer:

   For the IP head is 20 bytes, the number of fragments is $\frac{2400-20}{70-20} = 3.5 \approx 4$. The last datagram will be of size 360 containing 340 bytes data, and the other fragment will be of size 700 bytes containing 680 bytes. So, the offset of the 4 fragments will be:

   · 0

   · 85 (680/8 = 85)

   · 170 (85 + 680/8 = 170)

   · 255 (170 + 680/8 = 255)

   The first three fragments will all have flag = 1, and the last fragment will have the flag = 0.