1. "Forwarding" is about moving a packet from a router's input link to the appropriate output link. "Routing" is about determining the end-to-routes between sources and destinations.

2. a. No Vc number can be assigned to the new VC.
because the New VC cannot be established in the network.

b. one link has two available VC numbers.
4 links → $2^4 = 16$
One example : (10, 00, 00, 10)

3. a.

Prefix Match	Link Interface
11100000 00	0
11100000 01000000	1
11100000	2
11100001 1	3
otherwise	3

b. first address 5th entry: link interface 3.
second address 3rd entry: link interface 2.
third address 4th entry: link interface 3.

4. a. 128.119.40.129

b. Four equal size subnets:
128.119.40.64 /28 128.119.40.80 /28
128.119.40.96 /28 128.119.40.112 /28

5.

step	N	D(t), P(t)	D(u), P(u)	D(v), P(v)	D(w), P(w)	D(y), P(y)	D(z), P(z)
0	x	∞	∞	3, x	6, x	6, x	8, x
1	xv	7, v	6, v	3, x	6, x	6, x	8, x
2	xvu	7, v	6, v	3, x	6, x	6, x	8, x
3	xvuw	7, v	6, v	3, x	6, x	6, x	8, x
4	xvuwy	7, v	6, v	3, x	6, x	6, x	8, x
5	xvuwyt	7, v	6, v	3, x	6, x	6, x	8, x
6	xvuwytz	7, v	6, v	3, x	6, x	6, x	8, x

6. a. eBGP

b. iBGP

c. eBGP

d. iBGP

7. a. $32 - 4 = 28$ bits are available for multicast address.

Thus, the size of the multicast address space is $N = 2^{28}$.

b. The probability that two groups choose the same address is

$$\frac{1}{N} = 2^{-28} = 3.73 \times 10^{-9}$$

c. The probability that 1000 groups all have different address is

$$\frac{N * (N-1) * (N-2) * \cdots * (N-999)}{N^{1000}} = (1-\frac{1}{N})(1-\frac{2}{N}) \cdots (1-\frac{999}{N})$$

Ignoring cross-product terms, this is approximately equal to:

$$1 - (\frac{1+2+\cdots+999}{N}) = 1 - \frac{999 * 1000}{2N} = 0.998$$

Therefore, the probability that they interfere with each other is $1 - 0.998 = 0.002$.