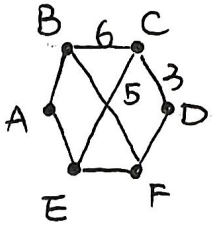
Homework 5

解雲暄 3190105871

1. (Refered to the answer) Yes. Some control packets should have higher prioirty.

2. 

TO	A	B	C	D	E	F
(6)+B	11	6	18	18	12	8
(3)+D	19	15	9	3	12	13
(5)+E	12	11	8	14	5	9

∴ C's routing tbl: A: 11:B, B: 6:B, C: 0:-, D: 3:D, E: 5:E, F: 8:B

3. 135.46.56.0/22 ⇒ 135.46.56.0 ~ 135.46.59.255 (56 → 00111000)

   135.46.60.0/22 ⇒ 135.46.60.0 ~ 135.46.63.255 (60 → 00111100)

3. 192.53.40.0/23 ⇒ 192.53.40.0 ~ 192.53.41.255

   ∴ (a) Int 1 (2) Int 0 (3) Router 2 (4) Router 1 (5) Router 2

4. a. Fail on R1: p; Fail on R2: $(1-p)p$; Succeed: $(1-p)^2$

   $\Rightarrow p + 2(1-p)p + 3(1-p)^2 = p^2 - 3p + 3$

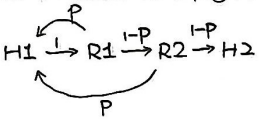
   b. $P_s \triangleq P(\text{Succeed}) = (1-p)^2$

   $\Rightarrow 1 \cdot P_s + 2 \cdot P_s(1-P_s) + 3 \cdot P_s(1-P_s)^2 + \cdots$

   $= 1 + (1-P_s) + (1-P_s)^2 + \cdots$

   $= \frac{1}{P_s} = \frac{1}{(1-p)^2}$

   c. (Thanks to 訓瑋!)

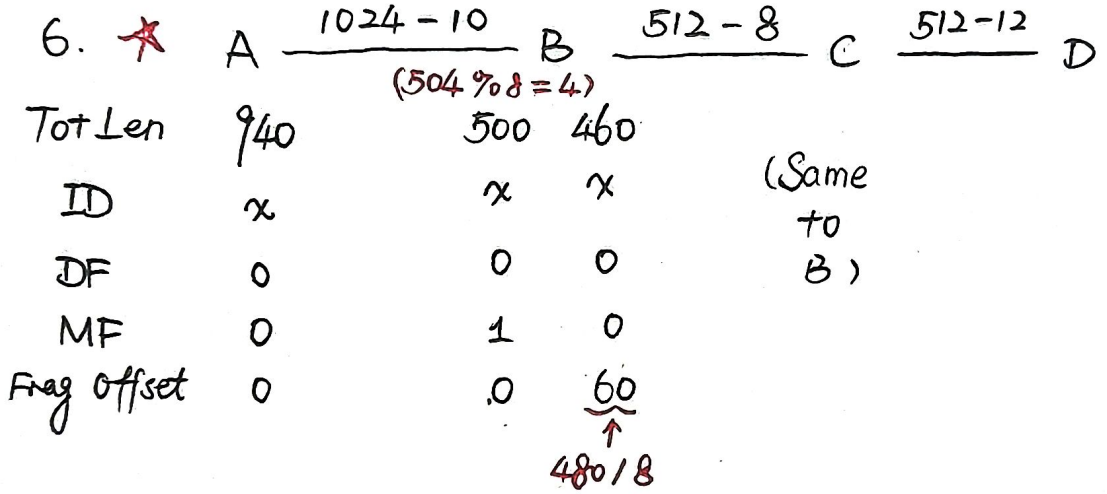
   

   $E = p \cdot (1+E) + p(1-p)(2+E) + (1-p)^2 \cdot 3$

   $\therefore E = \frac{p^2 - 3p + 3}{(1-p)^2}$

5. No. The network environment is complex and unpredictable. There might be congestion, error or even packet loss. There cannot be a guarntee.

6.



7. $240 = (1111\ 0000)_2$. 255.255.240.0 => /20, so it can handle $2^{12} - 2$ hosts.
8. $96 = (0110\ 0000)_2$, $104 = (0110\ 1000)_2$, $112 = (0111\ 0000)_2$, $120 = (0111\ 1000)_2$. So we can use **57.6.96.0/19** to aggregate them.
9. It's still possible as long as the 2 routers keep the same NAT table, i.e. use the same NAT box.
10. ARP uses IP address which is part of network layer, and helps network layer to use the service of link layer which requires a MAC address. So it's part of the service of network layer.
11. IP offers best offer delivery to lower the cost, so only checking the header caters to this design which can save some time. And the check might also be done by upper and lower layers. Checking the header is necessary because an error in the header is severe.
12. $\frac{2^{16\times 8}}{10^6} \cdot 10^{-12}\text{s} = 2^{128} \times 10^{-12}\text{s} = 2^{128} \times 2^{-60}\text{s} = 5 \times 10^{20}\text{s}$
13. Actually MAC address is permanently given to devices, which is hard for routing.
14. (Refered to the answer) Actually IPv6 moves the *Protocol* field to extension header pointed by *Next* as it's not so importent until it reaches its destination.
15. Yes. Only technically lengthen the IP address field.