CPE 348 FINAL EXAM (100 pts) – Solution Dec. 7th 2020

Q1: a)

```
          1 1 0 1 1 0
      ---------------
1101 | 1 0 1 0 1 1 0 0 0
       1 1 0 1
       -------
         1 1 1 1
         1 1 0 1
         -------
           1 0 1 0
           1 1 0 1
           -------
             1 1 1 0
             1 1 0 1
             -------
               1 1 1 0
               1 1 0 1
               -------
                 1 1 1
```

So, transmitted words are:

$$\boxed{10101111\underline{0}}$$

b)

```
          1 0 1 0 0 1
      ---------------
1101 | 1 1 1 0 0 0 1 1 0
       1 1 0 1
       -------
         1 1 0 0
         1 1 0 1
         -------
           1 1 1 0
           1 1 0 1
           -------
             1 1 1
```

there is a remainder, so error can be detected.

Q2:

a) For a single pkt,

$$t_0 = \frac{400}{10\times10^6} + 20\times10^{-6} + 10\times10^{-6} + \cancel{30\times10^{-6}} + \frac{400}{10\times10^6} + 30\times10^{-6} + 10\times10^{-6}$$

$$+ \frac{400}{10\times10^6} + 20\times10^{-6} = 210\ \mu s$$

For a total of 5 pkts:

$$t_{tot} = t_0 + 4\times\frac{400}{10\times10^6} = 370\ \mu s$$

b) $$r = \frac{2000}{370\times10^{-6}} = 5.4\times10^6\ bps$$

c) $$P = (0.95\times0.9)^5 = 0.457.$$

Q3:

Node	Transmissions			
	(1)	(2)	(3)	(4)
A	N	Y	N	Y
B	Y	Y	N	N
C	Y	N	Y	N
D	Y	Y	N	Y

Q4: a) consecutive 0s (OR baseline wander & clock recovery)

b) 3-bit

c) hidden nodes and exposed node

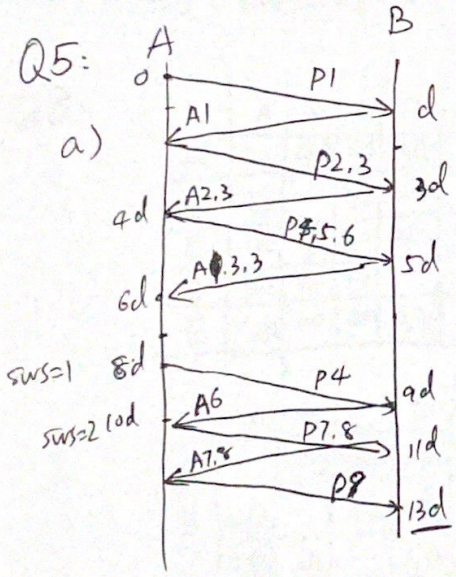
d) triangle routing

e) DEC bit, RED

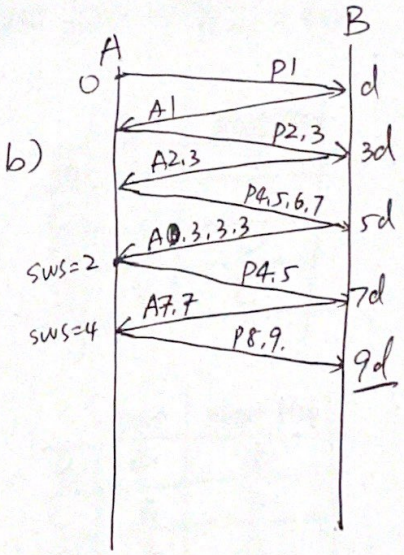
f) round robin.

Q5:

a)



b)



c) saved time: $\frac{13-9}{13} = 30.77\%$

Q6: a) router 3

b) router 2

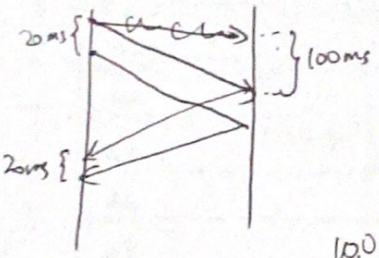
c) Interface 0

d) Interface 1

Q7: a) timeout > RTT which is 200ms. timeout should be a bit over 200ms.

b) NO. ~~efficiency $\frac{20}{100} = 20\%$~~ supposedly, $SWS_{optimal} = \frac{200}{20} = 10$

now, efficiency $= \frac{2}{10} = 20\%$



c) SWS=RWS= ~~100 200~~ ~~40~~ 20 $\frac{200\,ms}{5\,ms} = 40$

Q8:

	A	B	C	D	E
A	—	4/B	∞	3/D	3/E
B	4/A	—	2/C	∞	∞
C	∞	2/B	—	3/D	∞
D	3/A	∞	3/C	—	2/E
E	3/A	∞	∞	2/D	—

	Cost	Next Hop
B	4	B
C	—	—
D	3	D
E	3	E

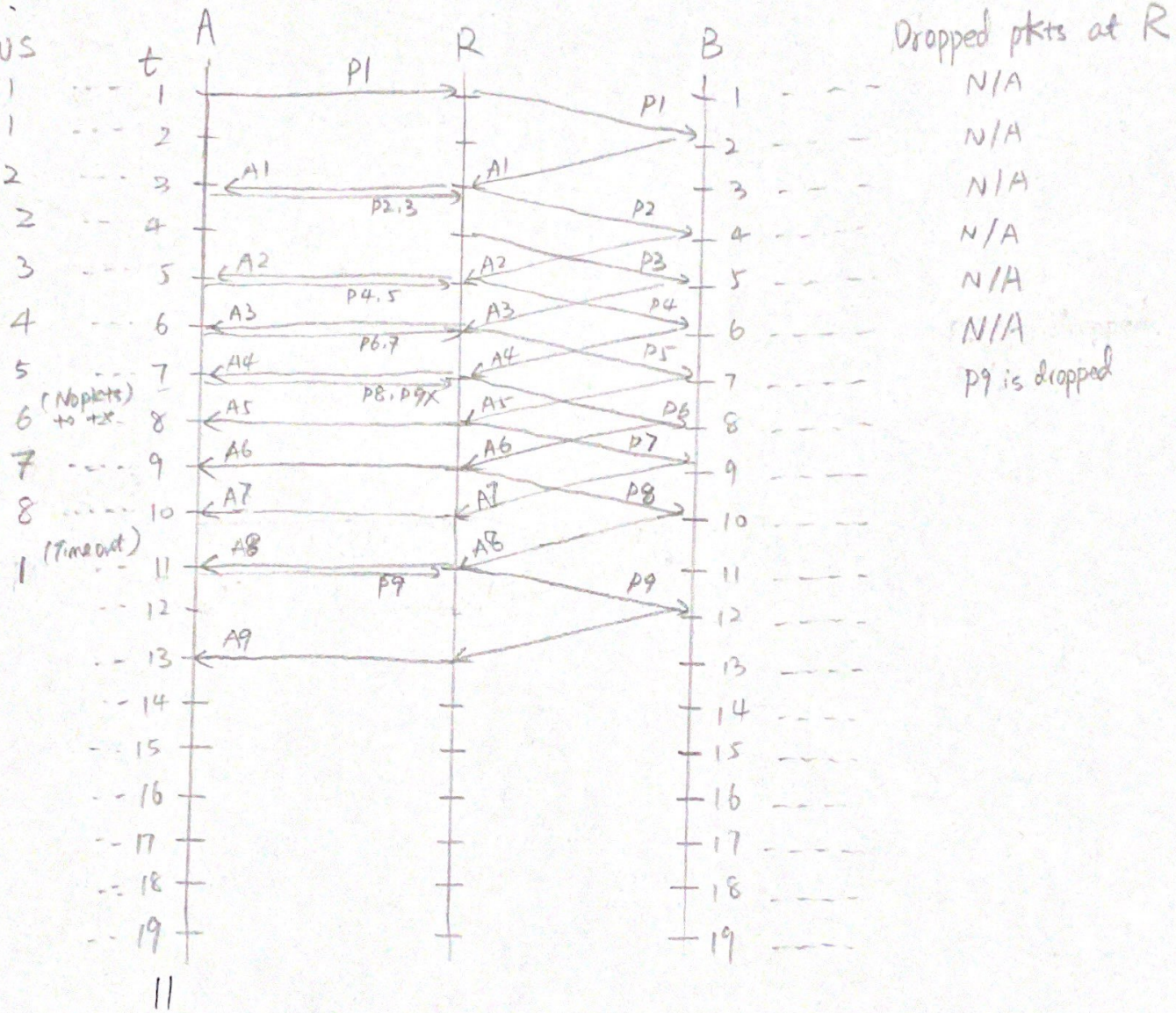
	A	B	C	D	E
A	—	4/B	3/D	3/D	3/E
B	4/A	—	2/C	3/A	3/A
C	3/D	2/B	—	3/D	2/D
D	3/A	3/A	3/C	—	3/A
E	3/A	3/A	2/D	3/A	—

	Cost	Next Hop
B	4	B
C	3	D
D	3	D
E	3	E

	A	B	C	D	E
A	—	4/B	3/D	3/D	3/E
B	4/A	—	3/A	3/A	3/A
C	3/D	3/D	—	3/D	3/D
D	3/A	3/A	3/C	—	3/A
E	3/A	3/A	3/A	3/A	—

	cost	Next Hop
B	4	B
C	3	D
D	3	D
E	3	E

Q9:



a) t = ~~10~~ sec

b) ~~7~~ 8

c) t = ~~12 sec~~ 12 sec