Question 5

Consider a 128×10^4 bits/second satellite communication link with one way propagation delay of 250 milliseconds. 6 bits are used for the sequence no field

(a)Assume that processing delays at nodes are negligible. And network Utilization is 80 % . Then Calculate frame size if following flow control technique is used

i Go-Back-N

ii Selective Repeat

iii Stop and Wait

i Go-Back-N

data rate $=128 * 10^4$b/s

$t_p = 250ms = 250 * 10^{-3}sec$

$n = 6bits$

$u = \frac{4}{5}$

$U = \frac{w * t_t}{t_t + 2t_p}$

W = 2^n - 1 = 2^6 - 1

= 64-1=63

$$= \frac{\frac{63 \times data}{128 \times 10^4}}{\frac{2 \times data + 128 \times 10^4}{256 \times 10^4}}$$

$$= \frac{126data}{2data + 128 * 10^4}$$

$$630 * data = 8data + 512 * 10^4$$

$$data = .823 * 10^4 bit$$

SELECTIVE REPEAT-

$$u = \frac{w * t_t}{t_t + 2t_p}$$

$$\frac{4}{5} = \frac{64 * d}{2data + 128 * 10^4}$$

$$data = \frac{512 * 10^4}{312}$$

$$data = 1.64 * 10^4 bit$$

STOP AND WAIT-

$$u = \frac{t_t}{t_t + 2t_p}$$

$$\frac{4}{5} = \frac{data}{128 * 10^4}$$

$$\frac{2 * data + 128 * 10^4}{256 * 10^4}$$

$$data = 256 * 10^4 bit$$

b.Considering the frame size, we have calculated in part-a , calculate the throughput of the system in case of Go-Back-N and Selective Repeat

go back n-

$$t = \frac{w*d}{t_t + 2t_p}$$

$$\frac{2^6 - 1 * data}{data}$$

$$\frac{63 * (.823 * 10^4}{2 * (.823 * 10^4 + 128 * 10^4 128 * 10^4 * 2}$$

$$\frac{13273.34 * 10^4}{129.646}$$

$$102.38 * 10^4 bits$$

SELECTIVE REPEAT-

$$t = \frac{w * d}{t_t + 2t_p}$$

$$\frac{\frac{2^{6-1*1.64*10^4}}{1.64*10^4+500}}{128*10^4+1000}$$

$$\frac{32 * 1.64 * 10^4}{\frac{2*1.64*10^4+128*10^4}{128*10^4*2}}$$

$$\frac{13434.88 * 10^8}{131.28 * 10^4}$$

$$102.33 * 10^4 bit/sec$$

c.Assume that processing delays at receiver node is 5ms. And network Utilization is 50 % . Then Calculate frame size if following flow control technique is used

a.Go-Back-N

b.Selective Repeat

c.Stop and Wait

GO-BACK-N-

$$u = \frac{t_t}{t_t + 2t_p + extratime}$$

$$\frac{1}{2} = \frac{2^6 - 1}{data\dfrac{data + 500 + 5}{128 * 10^4 + 1000 + 1000}}$$

$$\frac{1 * 63data * 100}{2 * 1000(data + 505 * 128 * 10}$$

$$126data = data + 505 * 1280$$

$$data = \frac{505 * 1280}{125}$$

$$data = 5171.2bit$$

SELECTIVE REPEAT-

$$u = \frac{w * t_t}{t_t + 2t_p + extratime}$$

$$\frac{32data}{128 * 10^4}\frac{1000data + 505 * 128 * 10^4}{128 * 10^4 * 1000}$$

$$\frac{1}{2} = \frac{32data}{data + 505 * 1280}$$

$$data = \frac{505 * 1280}{63}$$

$$data = 10260.31bit$$

STOP AND WAIT-

$u = \frac{t_t}{t_t + 2t_p + extratime}$

$$\frac{1}{2} = \frac{data}{128 * 10^4} \frac{200data + 101 * 128 * 10^4}{128 * 10^4 * 200}$$

$$400data = 200data + 101 * 128 * 10^4$$

$$data = \frac{1.01 * 128 * 10^4}{200}$$

$$data = 64.64 * 10^4$$

d.Considering the frame that we have calculated in part-c , calculate the throughput of the system in case of Go-Back-N and Selective Repeat

GO-BACK-N-

$$t = \frac{w * d}{t_t + 2t_p + extratime}$$

$$\frac{\frac{2^{6-1} * data}{data + 500 + 5\frac{128 * 10^4}{1000 + 1000}}}{\frac{63 * 5171.2}{200(5171.2) + 101 * 128 * 10^4 \frac{128}{200 * 10^4}}}$$

$$\frac{8340111360 * 10^4}{1034240 + 12928 * 10^4}$$

$$\frac{8340111360 * 10^4}{1047168 * 10^4}$$

$7964.44 bit/sec$

e.Suppose Throughput of the system is estimated as 64×10^4 bits per second.Then Calculate frame size if following flow control technique is used

a.Go-Back-N

b.Selective Repeat

c.Stop and Wait

GO-BACK-N-

$$t = \frac{w * d}{t_t + 2t_p}$$

$$64 * 10^4 = \frac{2^6 - 1 * data}{data + 500} \frac{128 * 10^4}{1000}$$

$$64 * 10^4 = \frac{126 data * 128 * 10^4}{2 data + 128 * 10^4}$$

$$data = \frac{128 * 10^4 * 64 * 10^4}{16000 * 10^4}$$

$data = 5120 bit$

SELECTIVE REPEAT-

$$t = \frac{w * d}{t_t + 2t_p + extratime}$$

$$\frac{32data}{2data + 128 * 10^4 \frac{1}{128 * 10^4 * 2}}$$

$$8192 * 10^{4data} = 128 * 10^4 data + 64 * 10^4 * 128 * 10^4$$

$$data = \frac{64 * 128 * 10^4}{8064 * 10^4}$$

$$data = 1.015 * 10^4 bit$$

STOP AND WAIT-

$$t = \frac{d}{t^t + 2t_p}$$

$$64 * 10^4 = \frac{data}{2data + 128 * 10^4 \frac{1}{128 * 10^4 * 2}}$$

$$128 * 10^4 data = 64 * 10^4 * 128 * 10^4$$

$$data = 64 * 10^4 bit$$

Question 7

Consider communication link with one way propagation delay of 150ns /km and transmission time of 120ms. 10 bits use for the sequence no feild

(a) Assume that processing delay at nodes are negligible.and network utilization is 70%.then calculate distance between sender and receiver. if following flow control technique is used.

i Go-Back-N

ii Selective Repeat

iii Stop and Wait

i Go-Back-N

Dilay=150ms/km

t_t=120ms

n=10bits

u=70U = $\frac{w * t_t}{t_t + 2t_p}$

W = 2^n - 1 = 2^{10} - 1

= 1024-1=1023

$\frac{7}{10}$=$\frac{1023 * 120}{120 + 2t_p}$

$7(120 + 2t_p) = 10(1023 * 120)$

$$840 + 14t_p = 1227600$$

$$14t_p = 1227600 - 840$$

$$14t_p = 1226760$$

$$t_p = \frac{1226760}{14}$$

$$t_p = 87625.7$$

$$t_p = 87625.7 * 10^{-3}$$

$$t_p = 87.6ms$$

$$\frac{Distance}{Speed} = 87.6$$

$$\frac{150}{87.6} = Speed$$

$$Speed = 1.7km/s$$

ii Selective Repeat

$$w=2^{n-1}$$

$$w=2^{10-1}$$

$$W=2^9$$

$$w=512$$

$$U = \frac{w * t_t}{t_t + 2t_p}$$

$$\frac{7}{10}=\frac{512 * 120}{120 + 2t_p}$$

$$7(120 + 2t_p) = 10(512 * 120)$$

$$840 + 14t_p = 6144000$$

$$14t_p = 6144000 - 840$$

$$14t_p = 6143160$$

$$t_p = \frac{6143160}{14}$$

$t_p = 438797.14$

$t_p = 438797.14 * 10^{-3} ms$

$t_p = 438.79 ms$

$$\frac{Distance}{Speed} = 438.79$$

$$\frac{150}{438.79} = Speed$$

$Speed = 0.34 km/s$

iii Stop and Wait

$$\mathrm{U} = \frac{t_t}{t_t + 2t_p}$$

$$\mathrm{u}=\frac{120}{120 + 2 * 87625.7}$$

$$\mathrm{u}=\frac{120}{175371.2}$$

u=0.00068

(B)considering the distance between sender and reciter,we have calculated in part-a,calculate the throughput of the system in case of Go-Back-N and selective Repeat.

i Go-Back N

$$\text{throughput} = \frac{w * d}{t_t + 2t_p}$$

$$\text{throughput} = \frac{1023 * 1}{120 + 2 * 87625.7}$$

$$\text{throughput} = \frac{1023}{175371.2}$$

$$\text{throughput} = 0.0058 bits/second$$

ii selective repeat

$$\text{throughput} = \frac{w * d}{t_t + 2t_p}$$

$$\text{throughput} = \frac{512 * 1}{120 + 2 * 438797.14}$$

$$\text{throughput} = \frac{512}{877714.28}$$

$$\text{throughput} = 0.00058 bits/second$$

(C)assume that processing delay at receiver node is 55ms.and network utilization is 50%hen calculate distance between sender and receiver if following flow control technique used

i Go-Back-N

ii Selective Repeat

iii Stop and Wait

i Go-Back-N

$$\text{U} = \frac{w * t_t}{t_t + 2t_p}$$

W = 2^n - 1 = 2^{10} - 1

= 1024-1=1023

$$\frac{5}{10} = \frac{1023 * 120}{120 + 2t_p}$$

$$5(120 + 2t_p) = 10(1023 * 120)$$

$$600 + 10t_p = 12276000$$

$$10t_p = 12276000 - 600$$

$$10t_p = 12275400$$

$$t_p = \frac{12275400}{10}$$

$$t_p = 1227540$$

$$t_p = 1227540 * 10^{-3}$$

$$t_p = 12275.4sec$$

$$\frac{Distance}{Speed} = 12275.4sec$$

$$\frac{150}{12275.4} = Speed$$

$$Speed = 0.01km/s$$

i selective Repeat

$$\mathrm{U} = \frac{w * t_t}{t_t + 2t_p}$$

W = 2^n - 1 = 2^{10} - 1

= 1024-1=1023

$$\frac{5}{10} = \frac{1023 * 120}{120 + 2t_p}$$

$$5(120 + 2t_p) = 10(512 * 120)$$

$$600 + 10t_p = 6144000$$

$$10t_p = 6144000 - 600$$

$$10t_p = 6143400$$

$$t_p = \frac{6143400}{10}$$

$$t_p = 614340$$

$$t_p = 614340 * 10^{-3}$$

$$t_p = 614.3ms$$

$$\frac{Distance}{Speed} = 614.3sec$$

$$\frac{150}{614.4} = Speed$$

$$Speed = 0.24km/s$$

iii Stop and Wait

$$\text{U} = \frac{t_t}{t_t + 2t_p}$$

$$\text{u}=\frac{120}{120 + 2 * 87625.7}$$

$$\text{u}=\frac{120}{175371.4}$$

u=0.00068

(D)considering the frame that we have calculated in part-c,calculate the throughput of the system in case of Go-Back-N and selective Repeat

i Go-Back-N

$$\text{throughput} = \frac{w * d}{t_t + 2t_p}$$

$$\text{throughput} = \frac{1023 * 1}{120 + 2 * 87625.7}$$

$$\text{throughput} = \frac{1023}{175371.4}$$

$$\text{throughput} = 0.0058 bits/sec$$

i Selective Repeat

$$\text{throughput} = \frac{w * d}{t_t + 2t_p}$$

$$\text{throughput} = \frac{512 * 1}{120 + 2 * 87625.7}$$

$$\text{throughput} = \frac{512}{175371.4}$$

$$\text{throughput} = 0.0029 bits$$

(E) Assume that processing delay at nodes are negligible.and network utilization is 100%.then calculate distance between sender and receiver. if

following flow control technique is used.

i Go-Back-N

ii Selective Repeat

iii Stop and Wait

i Go-Back-N

$$\mathrm{U} = \frac{w * t_t}{t_t + 2tp}$$

$$\frac{1}{10} = \frac{1023*120}{120+2t_p}$$

$$1(120 + 2t_p) = 10(1023 * 120)$$

$$120 + 2t_p = 1227600$$

$$2t_p = 1227600 - 120$$

$$12t_p = 1226640$$

$$t_p = \frac{1226640}{2}$$

$$t_p = 613320$$

$$t_p = 613320 * 10^{-3}$$

$t_p = 613.2sec$

$$\frac{Distance}{Speed} = 613.2$$

$$\frac{150}{613.2} = Speed$$

$Speed = 0.24km/s$

ii selective Repeat

$$\mathrm{U} = \frac{w * t_t}{t_p + 2t_p}$$

$$\frac{1}{10} = \frac{512 * 120}{120 + 2t_p}$$

$1(120 + 2t_p) = 10(512 * 120)$

$120 + 2t_p = 6144000$

$2t_p = 6144000 - 120$

$2t_p = 6143880$

$$t_p = \frac{6143880}{2}$$

$$t_p = 3071940$$

$$t_p = 3071940 * 10^{-3}$$

$$t_p = 3071.9sec$$

$$\frac{Distance}{Speed} = 3071.9$$

$$\frac{150}{3071.9} = Speed$$

$$Speed = 0.048km/s$$

iii Stop and Wait

$$\mathrm{U} = \frac{t_t}{t_t + 2t_p}$$

$\frac{1}{10}=\frac{120}{120+2t_p}$

$1(120+2t_p)=10(120)$

$120+2t_p=1200$

$2t_p=1200-120$

$2t_p=1080$

$t_p=\frac{1080}{2}$

$t_p=540$

$\frac{Distance}{Speed}=t_p$

$\frac{150}{540}=Speed$

$Speed=0.27km/s$