Q.1 A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the requirement to make this frame collision-free?

Solution

Average frame transmission time *Tfr* is 200 bits/200 kbps or 1 ms. The vulnerable time is 2 x1 ms =2 ms. This means no station should send later than 1 ms before this station starts transmission and no station should start sending during the one I-ms period that this station is sending.

Q.2 A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces

a. 1000 frames per second

b. 500 frames per second

c. 250 frames per second

**The throughput for pure ALOHA is S =G x *e-2G.***

**The maximum throughput Smax =0.184 when G =(1/2).**

**Solution:**

The frame transmission time is *200bits/200* kbps or 1 ms.

a. If the system creates 1000 frames per second, this is 1 frame per millisecond. The load is: In this case S =G x *e-2G* or S =0.135 (13.5 percent). This means that the throughput is 1000 X 0.135 =135 frames. Only 135 frames out of 1000 will probably survive.

b. If the system creates 500 frames per second, this is (1/2) frame per millisecond. The load is *(1/2).* In this case S = G x *e-2G* or S = 0.184 (18.4 percent). This means that the throughput is 500 x 0.184 =92 and that only 92 frames out of 500 will probably survive.

**Note that this is the maximum throughput case, percentagewise.**

c. If the system creates 250 frames per second, this is (1/4) frame per millisecond. The load is (1/4). In this case S = G x *e-2G* or S =0.152 (15.2 percent). This means that the throughput is 250 x 0.152 = 38. Only 38 frames out of 250 will probably survive.

**The throughput for slotted ALOHA is *S* =: G x *e*-G.**

**The maximum throughput *Smax* == 0.368 when G=1.**

Q.3 A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (all stations together) produces

a. 1000 frames per second

b. 500 frames per second

c. 250 frames per second

Solution

This situation is similar to the previous exercise except that the network is using slotted ALOHA instead of pure ALOHA. The frame transmission time is *200/200* kbps or 1 ms.

a. In this case G is 1. So S =G x *e*-*G* or *S* =0.368 (36.8 percent). This means that the throughput is 1000 x 0.0368 =368 frames. Only 368 out of 1000 frames will probably survive. Note that this is the maximum throughput case, percentagewise.

b. Here G is 1/2. In this case S =G x *e*-*G* or S =0.303 (30.3 percent). This means that the throughput is 500 x 0.0303 =151. Only 151 frames out of 500 will probably survive.

c. Now G is 1/4. In this case S =G x *e*-*G* or S =0.195 (19.5 percent). This means that the throughput is 250 x 0.195 = 49. Only 49 frames out of 250 will probably survive.