Assignment 1 – SENG3500

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| 1. | a. | No. of packets | = Amount of data generated / packet size / seconds per minute = 10\*106 / (2000-20)\*8 / 60 = 10.522… = 10 | |
|  | b. | Ldelay = (x / Llink ) + (P­bits / Ltrans)  0.004 = (x / 20\*106) + (2000\*8/(10\*106 /60))  0.004 = (x / 20\*106) + 0.096 | | |
|  | c. | 10\*(20\*8) = **1600 bps** | | |
| 2. | a. | RA = Total bits + packets  RA = (200000\*8) + ((200000/1560) \* 40 \* 8)  = **1.641 Mbps**  RB = (145000\*8) + ((145000/1560) \* 40 \* 8)  = **1.19 Mbps** | | |
|  | b. | Prouter = ((1.6 + 1.16 \* 1000000)) / (3960 \* 8)  = 88.41…  = **88 packets** | | |
|  | c. | Tlink3 = 88 \* (4000 \* 8)  = **2.816 Mbps** | | |
| 3. | a. | Ncirc = Rlink / Ruser  = 4 Mbps / 0.2Mbps  = **20 users** **max.** | | |
|  | b. | Pprob (x=4) = prob. of 4 current users, npop = total pop., kcurr = current pop., pprob = trans. prob.  Add the probabilities that there are 1, 2, 3 and 4 users active.  Pprob = (204) \* 0.154 \* (1-0.15)20-4 +  (203) \* 0.153 \* (1-0.15)20-3 +  (202) \* 0.152 \* (1-0.15)20-2 +  (201) \* 0.151 \* (1-0.15)20-1  = (4845 \* 0.00051 \* 0.07425) +  (1140 \* 0.00338 \* 0.06311) +  (190 \* 0.0225 \* 0.05365) +  (20 \* 0.15 \* 0.04560)  = 0.18347 + 0.24317 + 0.22935 + 0.1368  = 0.79279  = **79.28%** | | |
| 4. | a. | Rbits/sec = 2048\*8/0.04 \* 2  = 819200  = **0.8192 Mbps** | | |
|  | b. |  | | |
|  | c. | Dtrans = 2000 B / 0.8192 Mbps  = 19.531 ms  Dprop = 50 km / 3\*108 m/s  = 0.167 ms  Dtotal = Dtrans + Dprop  = **19.698 ms** | | |
| 5. | a. | Abits/sample = 16, Ssamples/sec = 44000  Tbit rate = 16 \* 44000 \* 2  = **1408** **kbps** | | |
|  | b. |  |  | |
|  | c. | Tdata size = data transmitted in 500 ms in bytes  Tdata size = ((1408 / 8) \* 1000 ) / 2  = 88000 bytes  Tpackets = 88000 / (800 - 8 - 20 - 18)  = 116.711…  = **117 packets** | | |
|  | d. | Ttrans = (Tdata size \* 8) / Tbit rate \* 1000)  Ttrans = 88000\*8 / (1408\*1000)  = 0.5  Tprop = Ddistance = Sspeed  Tprop = 100\*1000 / 3\*108  = 0.00033…  Tdelay = 0.5 + 0.00033  = **0.50033 ms** | | |
| 6. | a. | Polar NRZ |  | |
|  | b. | Bipolar |
|  | c. | Manchester |
|  | d. | Differential Manchester |
| 7. | a. | Nhome = 200, tint = 200, length = 2500  λsec = 1 / (200\*10-6) = 5000  λhour = 5000 \* 3600 = **18\*106** | | |
|  | b. | λbits/sec = 5000 \* (2500\*8) = 10\*107 = **0.1 Gb/s** | | |
|  | c. | р = λ / μ  p = 5000 / 100000  = **0.05** | | λ= 5000 packets/sec  μ = RLink/Lpacket bits  μ = 2\*109 / 2500 \* 8  = 100000 packets/sec |
|  | d. | D = [p / (1- p)] (1 / μ) + (1 / μ)  = [0.05 / 0.95] 1/100000 + 1/100000  = 0.05263 / 100000 + 1\*105  = 1.053\*10-5 + 1\*10-5  = 2.053\*10-5  = **20.53 μs** | | |