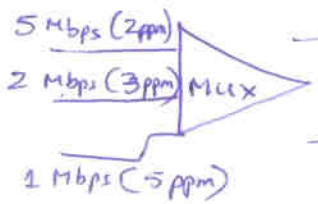
EC-305
Mini-Quiz #3

Nov. 2009 (Solutions) 10 Marks

1. [3 marks] 4



	1 sec	200 msec	# of stuff bits	Indicator
a →	±10 bits	±2 bits	⇒ 0, 1, 2, 3 or 4	⇒ 3
b →	±6 bits	±1.2 bits	⇒ 0, 1, 2, 3, or 4	⇒ 3
c →	±5 bits	±1 bit	⇒ 0, 1 or 2	⇒ 2

take this as $\lceil \pm 1.2 \rceil = \pm 2$ bits (∵ every 5th frame, we will have either 1-bit less or 1-bit more) -1-

stuff bits

a	b	c				a	b	c
32	16	3	3	2	4	4	2	$10^6 - 2$	$4\times10^5 - 2$	$2\times10^5 - 1$

indicator bits: a b c -1-

$\Rightarrow \left(\underbrace{66-5}_{61} + 10^6 + 4\times10^5 + 2\times10^5\right) \times 5$ Mbps

$\Rightarrow$ 8 Mbps + 305 bits/sec (61×5) $\Rightarrow$ **8.000305 Mbps** -1-

2. [7 marks] 6

$$A + \left(G_T + G_R - L_{2m} - 10\log_{10} d^N\right) = 0$$

(23, 23, 36)

Case (i) A = 30 dBj; F = 4 dB $\Rightarrow$ $-30 = 10 - 20\log_{10} d \Rightarrow$ **d = 100m** -1-

$\therefore N_T = \frac{10,100}{100} = 101$ hops $\Rightarrow$ **N = 100** -1-

$\Rightarrow 18 = P_T - \left(-101 + 10\log_{10} 100^{N} + 30^{A} + 4^{F}\right) \Rightarrow$ **$P_T = -29$ dBm** -1-

Case (ii) A = 40 dBj; F = 8 dB $\Rightarrow -40 = 10 - 20\log_{10} d$

$\Rightarrow d = 10^{5/2} =$ **316.23 m** -1-

$\therefore N_m = 31.94 \approx 32$

$\Rightarrow$ **N = 31 hops** -1-

$\Rightarrow 18 = P_T - \left(-101 + 10\log_{10} 31 + 40 + 8\right) \Rightarrow$ **$P_T = -20.08$ dBm** ≈ -20 dBm -1-

while both solutions do not meet the spec on max $P_T \le -30$ dBm, case (i) at -29 dBm is "nearly" OK !

(*) For single link of 10km, P_T required would be +27 dBm + NF of Rx

KG/IITM/Nov-2009