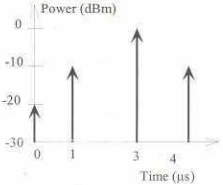
EEE 434 MT 2
2 May, 2003
4+1 Questions, 90 mins
Question 5 is bonus
Show your calculations clearly in the space provided and write your results in the Answer boxes.

Name: SOLUTIONS

Surname:



1. (a) (3 pts) Calculate the mean delay and rms delay spread of a channel having the characteristics shown in the figure.
(b) (1 pt) What is the (relaxed, frequency correlation funcion>0.5) coherence bandwidth ?
(c) (2 pt) Consider two digital transmitted signal envelopes:
i. $c_1(t) = \exp(-10^{10}\times t^2)$
ii. $c_2(t) = \{\exp(-10^6\times t)\}\cos(2\pi\times 10^4\times t)$;
Will either one of the signals be distorted significantly by the channel impulse response? Why?

(a) $\tau_{av} = 2.9$ nsec ; $\bar{\tau}^2 = 8.84\ (\text{nsec})^2$

$\tau_{rms} = 0.658$ nsec.

(b) $B_c \approx \frac{1}{5\tau_{rms}} = 304$ kHz

(c) $c_1(t)$: Half power width of envelope : Δt

$e^{-10^{10}t_1^2} = \frac{1}{\sqrt{2}} \Rightarrow t_1 = 5.9\times 10^{-6}$ sec

$\therefore \Delta t = 2t_1 = 11.8\times 10^{-6}$ sec.

$\therefore$ BW of pulse $= \frac{1}{\Delta t} = 84.7$ kHz $\ll B_c$

BW of env. is about 25% of B_c. $\Rightarrow$ flat fading negligible distortion.

$\rightarrow c_2(t)$: $\tau = 10^{-6}$ sec $\Rightarrow$ BW $= \frac{1}{\tau} = 1$ MHz $\gg B_c$

$\therefore$ frequency selective fading

$\therefore$ significant distortion.

Ans: (a)

(b)