

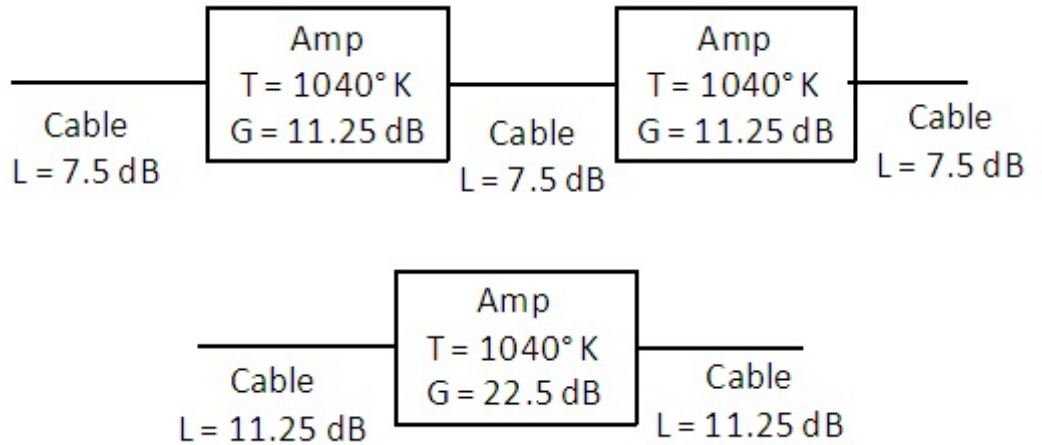
ECEN5533 Exam #1 29 September 2011

1) [25] Two equal cost cable systems are shown below. Which has the lower System Noise

Temperature T_{sys} ?

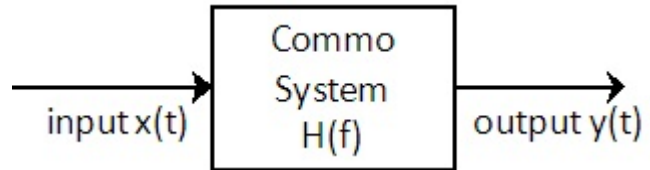
Support your conclusion with some appropriate math.

[Answer: $T_{sys_top} = 10,460^\circ K$ is lower. $T_{sys_bottom} = 17,721^\circ$.]



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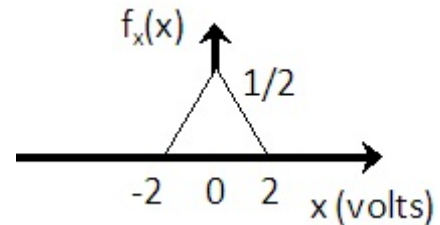
2) A unit impulse $\delta(t)$ is injected into a communications system, and an output $y(t) = \delta(t) - 0.5\delta(t-0.000001)$ results. [25] Sketch the system's power transfer response, $|H(f)|^2$.



[You should sketch $|H(f)|^2 = 1.25 - \cos(2\pi f 10^{-6})$. Note that an RF transfer function of this nature might occur due to multipath.]

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3) A signal $x(t)$ with the voltage PDF $f_X(x)$ shown is input to a 4 bit mid-rise uniform quantizer. The saturation voltage of this particular quantizer is 4 volts; i.e. the quantizer is expecting a maximum voltage swing of 8 volts peak-to-peak. [25] Calculate the Quantizer output SNR.



[32]

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4) A 36 GHz, 15.5 Km RF link has a transmitter power of -30 dB watts. The transmitter and receiving antennas are parabolic with a physical area of 0.2 square meters and efficiency $\eta = 0.67$. Other losses = 0 dB.

[25] Calculate the expected received signal power P_r at the receiver antenna output.

[1.084 nanowatts]