

# Principles of Communications 7th Edition Solution Manua

## Problem A.1

All parts of the problem are solved using the relation

$$V_{\text{rms}} = \sqrt{4kTRB}$$

where

$$\begin{aligned} k &= 1.38 \times 10^{-23} \text{ J/K} \\ B &= 30 \text{ MHz} = 3 \times 10^7 \text{ Hz} \end{aligned}$$

- a. For  $R = 10,000$  ohms and  $T = T_0 = 290$  K

$$\begin{aligned} V_{\text{rms}} &= \sqrt{4(1.38 \times 10^{-23})(290)(10^4)(3 \times 10^7)} \\ &= 6.93 \times 10^{-5} \text{ V rms} \\ &= 69.3 \mu\text{V rms} \end{aligned}$$

- b.  $V_{\text{rms}}$  is smaller than the result in part (a) by a factor of  $\sqrt{10} = 3.16$ . Thus

$$V_{\text{rms}} = 21.9 \mu\text{V rms}$$

- c.  $V_{\text{rms}}$  is smaller than the result in part (a) by a factor of  $\sqrt{100} = 10$ . Thus

$$V_{\text{rms}} = 6.93 \mu\text{V rms}$$

- d. Each answer becomes smaller by factors of 2,  $\sqrt{10} = 3.16$ , and 10, respectively.

## Problem A.2

Use

$$I = I_s \exp \frac{eV}{kT} - 1$$

We want  $I > 20I_s$  or  $\exp \frac{eV}{kT} - 1 > 20$ .

- a. At  $T = 290$  K,  $\frac{e}{kT} = \frac{1.6 \times 10^{-19}}{1.38 \times 10^{-23} \times 290} \approx 40$ , so we have  $\exp(40V) > 21$  giving

$$V > \frac{\ln(21)}{40} = 0.0761 \text{ volts}$$

$$I_{\text{rms}}^2 = 2eIB + 2eBI_s \exp \frac{eV}{kT}$$

$$\text{or } \frac{I_{\text{rms}}^2}{B} = 2eI_s \exp \frac{eV}{kT}$$

$$\begin{aligned} &= 2(1.6 \times 10^{-19})(1.5 \times 10^{-5}) \exp(40 \times 0.0761) \\ &= 1.0075 \times 10^{-22} \text{ A}^2/\text{Hz} \end{aligned}$$

- b. If  $T = 90$  K, then  $\frac{e}{kT} = 129$ , and for  $I > 20I_s$ , we need  $\exp(129V) > 21$  or

$$V > \frac{\ln(21)}{129} = 2.36 \times 10^{-2} \text{ volts}$$

# Principles Of Mobile Communications Solution Manual Pdf

**Emilie Sanchez**



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Cellular Mobile Communication Gottapu Sasibhushana Rao,2012-01-01 Mobile Cellular Communication covers all the important aspects of cellular and mobile communications from the Internet to signals access protocols and cellular systems and is a self sufficient resource with adequate stress on the principles that govern the behavior of mobile communication along with the applications The book includes applications such as designing planning installation and maintenance of cellular operators I FI and WIMAX ZIBEE BLUETOOTH and GPRS networks It also includes advanced technologies like CDMA 2000 WCDMA 3G 4G and beyond 4G and contains 160 examples and 540 exercises

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