Problem 9.2 A DSC-SC modulated signal is transmitted over a noisy channel, having a noise spectral density $N_0/2$ of 2×10^{-17} watts per hertz. The message bandwidth is 4 kHz and the carrier frequency is 200 kHz. Assume the average received power of the signal is -80 dBm. Determine the post-detection signal-to-noise ratio of the receiver.

Solution
From Eq. (9.23), the post-detection SNR of DSB-SC is

$$\text{SNR}_{\text{post}}^{\text{DSB}} = \frac{A_c^2 P}{2 N_0 W}$$

The average received power is $\dfrac{A_c^2 P}{2} = -80 \; dBm = 10^{-11}$ watts. With a message bandwidth of 4 kHz, the post-detection SNR is

$$\text{SNR}_{\text{post}}^{\text{DSB}} = \frac{10^{-11}}{(4 \times 10^{-17})4000} = 62.5 \sim 18.0 \; dB$$