8-4

$$2 f_{max} = 2(1\ kHz) = 2\ kHz$$

(a) $f_{samp} \geq$ ~~$2\ BW = 2(900\ Hz) = 1.8\ kHz$~~

(b) Step size $= \delta v = \dfrac{\text{Range}}{2^n} = \dfrac{2}{2^4}$

$= 0.125$

16 quantization Levels

min. level : $-1 + \dfrac{0.125}{2} = -0.9375\ V$

max level : $-1 - \dfrac{0.125}{2} = 0.9375\ V$

(c) maximum quantization error :

$$\frac{\text{Step size}}{2} = \frac{0.125}{2} = 62.5\ mV$$

(d) $BW > n\ f_{samp}$

$>$ ~~$4(1.8\ kHz)$~~ $4(2\ kHz)$

$>$ ~~$7.2\ kHz$~~ $8\ kbps$