Problem 5.19

(a) We are given
- Video bandwidth = 4.5 MHz
- Sampling rate = 15% in excess of the Nyquist rate
- Uniform quantization using 1024 levels
- Binary encoding

(b) The Nyquist rate is 2 x 4.5 = 9 MHz.
Actual sampling rate = 9 x 1.15 = 10.35 MHz
The sampling period is therefore

$$T_s = \frac{1}{10.35}\mu s$$

This sampling rate must be divided into B bits, where

$2^B = 1024$

Hence, $B = 10$. The bit duration is therefore

$$\frac{T_s}{10} = \frac{1}{103.5}\mu s$$

The permissible bit rate is therefore 103.5 megabits/s.