9.14 a) The FFT has N_{tot} butterflies

$$N_{tot} = \frac{N}{2} log_2(N) = \frac{1024}{2} log_2(1024) = 5120 \text{ butterflies}$$

The number of processor is $N_p = \frac{5120 \cdot 1000 \cdot 23}{120\ 10^6} \approx 0.981 < 1$

The processor schedule is sequential since only one processor is used.

b) See Problem 9.13.

c) In average we execute $\frac{5120}{10^{-3}}$ butterflies per second. The bit rate to the processor is: $\frac{5120}{10^{-3}} \cdot 23 \approx 118$ MHz

d) The number of bits per second through the cut A-A'

$$(4 + 4) \frac{5120}{10^{-3}} \cdot 23 = 942.08 \text{ Mbit/s}$$

and through the cut B-B'

$$\frac{N_m \cdot W_m}{T_{RAM}} = \frac{N_m \cdot W_m}{17\ 10^{-9}} \Rightarrow N_m = \frac{942.08\ 10^6 \cdot 17\ 10^{-9}}{W_m}$$

We select $W_m = 21 \Rightarrow N_m \approx 0.76 < 1$

e) We need 2·1024 21-bit words $\Rightarrow$ 43008 bits.

f) We select 8 RAMs each with 128 × 42-bit words. This selection yield a reasonable length/width ratio for the memories.

g) The memory access rate is $942.08\ 10^6 = 8 \cdot 42 \cdot f_m \Rightarrow$
$\Rightarrow f_m = 2.80$ MHz