6.15 **a)** The critical loop in cascade form with direct form I or II first- and second-order sections is

$$T_{min} = T_{mult} + T_{add}$$

If the poles are located on the imaginary axis (corresponding to the bireciprocal WDF).

$$T_{min} = (T_{mult} + T_{add})/2$$

b) The critical loop in parallel form is the same as for the cascade form.

c) The critical loop in the lattice wave digital filter is between two adaptors

$$T_{min} = 2(T_{mult} + 2 \ T_{add})$$

In bireciprocal lattice wave digital filters $T_{min} = T_{mult} + 2 \ T_{add}$

d) The critical loop is also through two adaptors if the delay elements are places alternatingly in the upper and lower branches. Hence, direct form I and II are generally somewhat faster structures than lattice filters.