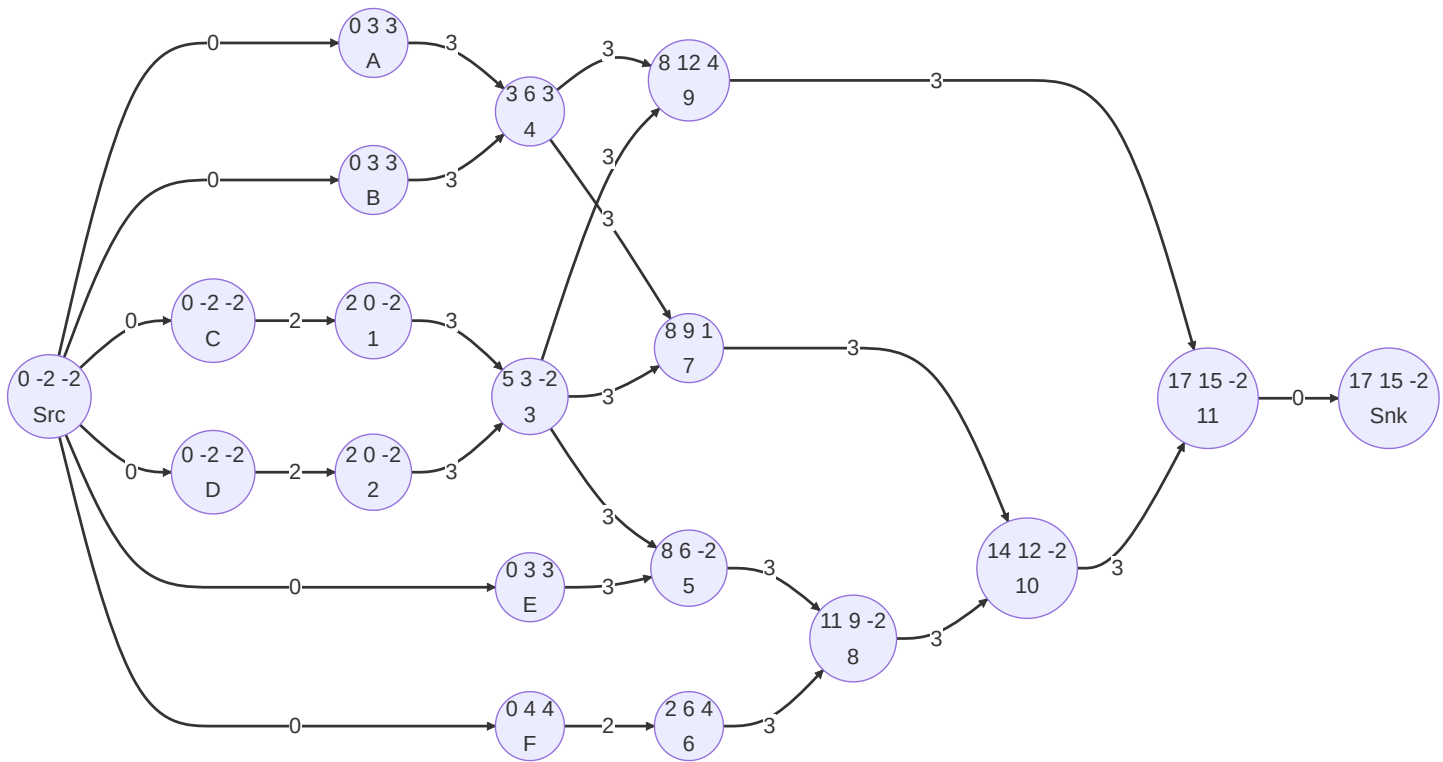# Written Assignment Three

1

a),e),f)

2

There is a timing violation because the worst slack is -2.

The longest path is
Src-C-1-3-5-8-10-11-Snk and Src-D-2-3-5-8-10-11-Snk.

3

a),c)

4

a

$R_{a-1} = \frac{0.5 \times 1200}{1} = 600$

$R_{1-b} = \frac{0.5 \times 800}{0.5} = 800$

$R_{1-2} = \frac{0.5 \times 1600}{1} = 800$

$R_{2-3} = \frac{0.5 \times 600}{0.5} = 600$

$R_{3-c} = \frac{0.5 \times 600}{0.5} = 600$

$R_{3-d} = \frac{0.5 \times 1000}{0.5} = 1000$

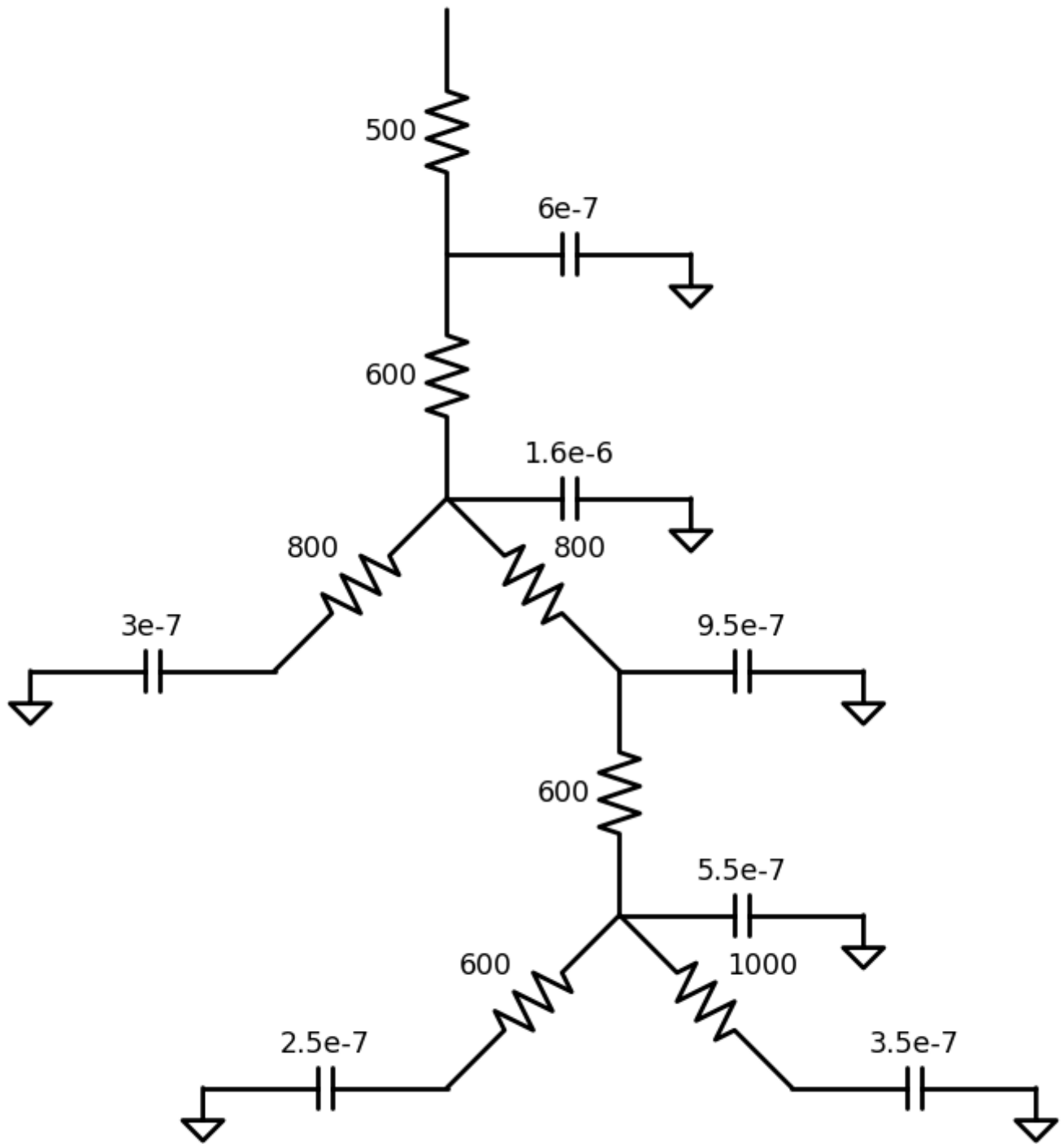$C_{a-1} = 1 \times 10^{-9} \times 1200 \times 1 = 1.2 \times 10^{-6}$

$C_{1-b} = 1 \times 10^{-9} \times 800 \times 0.5 = 4 \times 10^{-7}$

$C_{1-2} = 1 \times 10^{-9} \times 1600 \times 1 = 1.6 \times 10^{-6}$

$C_{2-3} = 1 \times 10^{-9} \times 600 \times 0.5 = 3 \times 10^{-7}$

$C_{3-c} = 1 \times 10^{-9} \times 600 \times 0.5 = 3 \times 10^{-7}$

$C_{3-d} = 1 \times 10^{-9} \times 1000 \times 0.5 = 5 \times 10^{-7}$

b

$$\tau_a = 500 \times (4.6 \times 10^{-6}) = 0.0023$$
$$\tau_{a-1} = \tau_a + 600 \times (4 \times 10^{-6}) = 0.0047$$
$$\tau_{a-b} = \tau_{a-1} + 800 \times (3 \times 10^{-7}) = 0.00494$$
$$\tau_{a-2} = \tau_{a-1} + 800 \times (2.1 \times 10^{-6}) = 0.0047 + 0.00168 = 0.00638$$
$$\tau_{a-3} = \tau_{a-2} + 600 \times (1.15 \times 10^{-6}) = 0.00707$$

$$\tau_{a-c} = \tau_{a-3} + 600 \times (2.5 \times 10^{-7}) = 0.00707 + 0.00015 = 0.00722$$
$$\tau_{a-d} = \tau_{a-3} + 1000 \times (3.5 \times 10^{-7}) = 0.00707 + 0.00035 = 0.00742$$

So $\tau_{a-b} = 0.00494, \tau_{a-c} = 0.00722, \tau_{a-d} = 0.00742$