11-73)

The idea is that the extra pressure exerted by the fetus just above the bladder is a trigger for the urge to urinate. Your text suggest that a pressure of 25 mmHg is sufficient.

First, convert mmHg to Pascals:

$$25 \text{ mmHg} \times \frac{1 \text{ atm}}{760 \text{ mmHg}} \times \frac{101,000 \text{ Pa}}{1 \text{ atm}} = 3322 \text{ Pa}$$
.

Let's examine the fetus. There is a normal force of contact between the fetus and the mother, which we'll assume is vertically upward. We'll also assume that the fetus is not moving around (a = 0).

$$-gm + F_N = 0$$
  
$$F_N = gm = 10(3.5) = 35 N .$$

The other half of the third law pair of this force pushes down on the bladder and is spread out over an area A of 90 cm<sup>2</sup> =  $0.009 \text{ m}^2$ . The pressure is then

$$P = \frac{F_N}{A} = \frac{35}{0.009} = \frac{3889 \text{ Pa}}{3889 \text{ Pa}} > 3322 \text{ Pa}$$
.

So, yes, this may well initiate urination.