

**CS 720, Fall 2016**  
**Homework 8**

**Due Date: November 9**

1. Let  $TS$  be the transition system in Figure 5.25 of the text and let

$$fair = \Box\Diamond(a \wedge b) \rightarrow \Box\Diamond\neg b.$$

- (a) Which paths in  $TS$  are fair under this fairness constraint?
- (b) For each of the three formulas  $\varphi_i$  below, state whether  $TS \models_{fair} \varphi_i$ . If your answer is no, give an example of a fair path in which the formula does not hold.
- i.  $\varphi_1 = b\mathbf{U}\Box\neg b$ ;
  - ii.  $\varphi_2 = \Diamond\Box a$ ;
  - iii.  $\varphi_3 = \Box(a \wedge b \rightarrow \bigcirc\neg a)$ .
2. Baier and Katoen, Exercise 5.14.  
(In Part (a), you do not have to use the algorithm from class to produce your NBAs. You can use any NBA for  $\neg\varphi_i$ . In Part (c), you do not have to use the DFS method. Instead, you can analyze the strongly connected components. You do not have to do Part (d).)
3. Baier and Katoen, Exercise 5.18.  
(In Part (b), you must use the method from class to produce the GNBA. The states will be the elementary sets you compute in Part (a).)