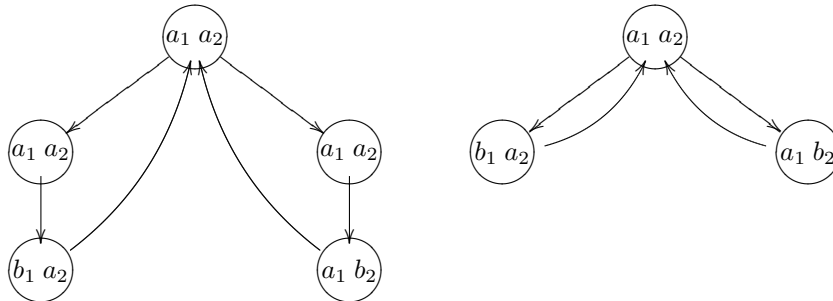


- Write a CTL<sub>-X</sub> formula that distinguishes the following systems:



(Intuition:  $a_i$  - local activity of the process  $i$ ;  $b_i$  - process  $i$  in critical section.)

Are the two systems distinguishable by a LTL<sub>-X</sub> formula ?

- Draw a Büchi automaton over the alphabet  $\mathcal{P}(a, b)$  that recognizes the following property of  $\omega$ -words:

$$bUa \wedge bU\neg a \wedge GFa.$$

- Draw an OBDD, of possibly small size, for the boolean function:

$$f(u, v, w, x, y) = ((x \iff u) \wedge (y \iff \neg v)) \vee ((x \iff \neg(u \vee w)) \wedge (y \iff \neg v)).$$

For readability omit edges that lead to the 0 final vertex.

(Intuition: think of  $x, y$  as of values of a „nondeterministic“ function of  $u, v, w$ .)

- Annotate the following code with JML specifications ensuring that all references to the array are correct and that all notes are in the interval [2,5].

```
public class Exam {

    int notes[];

    Exam(int initNotes[]) { notes = initNotes; }

    public void setNote(int who, int what) { notes[who] = what; }

    public int getNote(int who) { return notes[who]; }

    public void changeNote(int who, int delta) {
        setNote(who, getNote(who) + delta);
    }
}
```

```
public class Exam {  
    int notes[];  
  
    Exam(int initNotes[]) { notes = initNotes; }  
  
    public void setNote(int who, int what) { notes[who] = what; }  
  
    public int getNote(int who) { return notes[who]; }  
  
    public void changeNote(int who, int delta) {  
        setNote(who, getNote(who) + delta);  
    }  
}
```