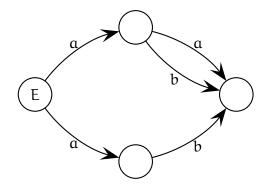
Modal Logic

1. Consider the following transition system:



Which of the following are correct?

(a)
$$E \models \langle \alpha \rangle true$$

(e)
$$E \models \langle \alpha \rangle \langle \alpha \rangle true$$

(i)
$$E \models [a]\langle a \rangle true$$

(b)
$$E \models \langle b \rangle true$$

(f)
$$E \models \langle a \rangle \langle b \rangle true$$

(j)
$$E \models [a]\langle b \rangle true$$

(c)
$$E \models [a]$$
 false

(g)
$$E \models \langle \alpha \rangle [\alpha]$$
 false

(k)
$$E \models [a][a]$$
 false

(d)
$$E \models [b]$$
 false

(h)
$$E \models \langle a \rangle [b]$$
 false

(1)
$$E \models [a][b]$$
 false

2. Consider the following process definition.

$$A \stackrel{\text{def}}{=} b.c.0 + b.d.0$$

$$B \stackrel{\text{def}}{=} A + b.(c.0 + d.0)$$

$$C \stackrel{\text{def}}{=} a.B + a.A$$

$$B \stackrel{\text{def}}{=} A + b.(c.0 + d.0)$$

$$D \stackrel{\text{def}}{=} a.B$$

- (a) Draw a process graph which includes the states for A, B, C and D.
- (b) For which n do we have that $C \sim_n D$? Justify your answer.
- (c) Give two formulæ of the modal logic **HML** which distinguish between C and D: one formula which is true of C but not D; and one formula which is true of D but not C.