

Problem Set 3

Problem 1:

1. $\neg In(B) \vee \neg In(D)$ and $\neg In(F) \vee \neg In(H)$
2. $In(B) \iff Order(B, 1) \vee Order(B, 2) \vee Order(B, 3) \vee Order(B, 4)$ and $In(D) \iff Order(D, 1) \vee Order(D, 2) \vee Order(D, 3) \vee Order(D, 4)$
3. $Order(A, 1) \vee Order(B, 1) \vee Order(C, 1) \vee Order(D, 1) \vee Order(E, 1) \vee Order(F, 1) \vee Order(G, 1) \vee Order(H, 1)$ and $Order(A, 2) \vee Order(B, 2) \vee Order(C, 2) \vee Order(D, 2) \vee Order(E, 2) \vee Order(F, 2) \vee Order(G, 2) \vee Order(H, 2)$
4. $\forall V \in G, I \leq K, V \neq A, Order(A, I) \implies \neg Order(V, I)$ and $\forall V \in G, I \leq K, V \neq B, Order(B, I) \implies \neg Order(V, I)$
5. $\forall I \leq K, I \neq 1, V \in G, Order(V, 1) \implies \neg Order(V, I)$ and $\forall I \leq K, V \in G, I \neq 2, Order(V, 2) \implies \neg Order(V, I)$

Problem 2

Constrain 1: Every tasks is executed and with in time limit

We need to make sure every task is executed, so we need to have $\forall T, \exists P, \exists I \leq M$ such that $Exec(T, P, I)$ is true.

Example: For $T = 1$, there must exist a P, I that $Exec(1, P, I)$ is true

Constrain 2: If there is an arc from U to V then U is executed before V.

$\forall U, \forall V, edge(U, V) \implies \exists t_1 \exists t_2 \exists p_1 \exists p_2$ such that $Exec(U, p_1, t_1) \wedge Exec(V, p_2, t_2) \wedge (t_1 < t_2)$

Example: For $U = A, V = D, edge(U, V) = true$, implies that exist a pairs of t_1, t_2, p_1, p_2 that $Exec(A, p_1, t_1) \wedge Exec(D, p_2, t_2) \wedge (t_1 < t_2)$

Constrain 3: No two tasks running on same processor at same time

If $Exec(U, P, T)$ is true, then there are no V such that $Exec(V, P, T)$ is true.

Example: if $Exec(A, 1, 1)$ is true, then $Exec(B, 1, 1), Exec(C, 1, 1)$ etc are all false.

Constrain 4: No tasks been execute twice

If $Exec(U, P, T)$ is true, then there is no $(P', T') \neq (P, T)$ such that $Exec(T, P', T')$ is true.

Example: if $Exec(A, 1, 1)$, then $Exec(A, 1, 2)$ and $Exec(A, 1, 3)$ and $Exec(A, 1, 4)$ etc are all false.

Problem 3

1. $\forall p, \forall q, (F(p, q) \implies F(q, p))$
2. $\forall p, \forall q, (C(p, q) \implies \neg C(q, p))$
3. $\exists f, (F(A, f) \wedge F(B, f))$
4. $\forall c_1, (C(c_1, A) \implies \forall c_2 C(c_2, B) \wedge \neg F(c_1, c_2))$
5. $\exists p \forall c, (C(D, f) \wedge C(c, B) \implies F(f, c))$
6. $\forall f, (F(f, D) \implies \exists c, C(c, f))$
7. $\forall f, (F(f, A) \implies \exists c, \forall gc, C(c, f) \wedge \neg C(gc, c))$
8. $\forall c, (C(c, B) \implies \forall gc, \neg C(gc, c))$