

HW9

Thursday, May 18, 2023 2:48 PM

(a) Is the expression in conjunctive normal form (CNF)?

The given expression is $(x + w)(w + z)$. It is not in CNF because it contains a product term $(x + w)(w + z)$. CNF requires each term to be a sum of literals connected by logical AND operators.

(b) Transform the expression into a 3-CNF expression:

To convert the expression into 3-CNF, we need to introduce new logical variables and apply the distributive property. Let's break it down:

Original expression: $(x + w)(w + z)$

Apply distributive property:

$(xw + xz) + (ww + wz)$

Further simplify:

$xw + xz + w + wz$

Now, we have four terms: xw , xz , w , and wz . We can treat each of them as a new logical variable:

Let $q_0 = xw$

Let $q_1 = xz$

Let $q_2 = w$

Let $q_3 = wz$

The 3-CNF expression becomes:

$q_0 + q_1 + q_2 + q_3$

(c) Construct an undirected graph from the 3-CNF expression and find a minimal node cover:

To construct the graph, we consider each literal (variable or its negation) as a node. For each clause in the 3-CNF expression, we add edges between the nodes representing the literals in that clause.

The clauses in our 3-CNF expression are:

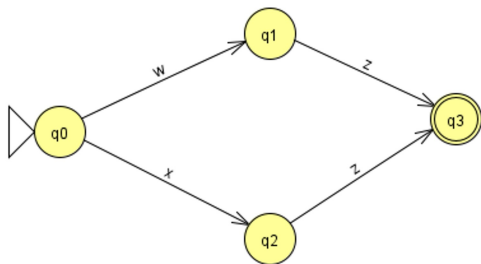
Clause 1: q_0

Clause 2: q_1

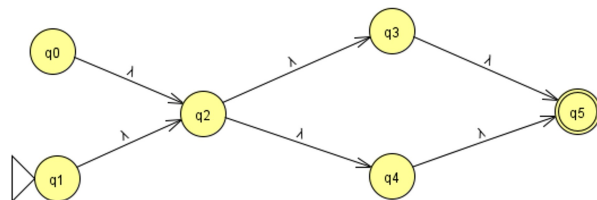
Clause 3: q_2

Clause 4: q_3

(a)



(b)



(c)

