

## ASSIGNMENT # 2

### CSE356– FORMAL METHODS

DUE DATE: 13-11-2020

TOTAL MARKS: 30

#### Instructions:

- Assignment should be hand written or typed on A4 page size, with front page having the following details. **(Note: Failing to attach the front page with the following details will result in deduction of 5 marks)**

Reg. # : \_\_\_\_\_

Name : \_\_\_\_\_

Course Title : \_\_\_\_\_

Section : \_\_\_\_\_

Assignment # : \_\_\_\_\_

Submitted to : \_\_\_\_\_

Date : \_\_\_\_\_

(Font size 16, Times New Roman)

- Questions should solve in order as given in assignment.
- No marks for late submission.
- Assignment should be well formatted.
- While solving each question, do show all intermediate steps.

#### Question 1:

[Marks: =20]

A database of application of wholesaler can be modelled by means of the relations *price*, *in\_stock* and *supplies*. *Price* is a relation over  $products \times 1 \dots 30$ , which models the association between prices and stock items. *In\_stock* is a relation over  $products \times \mathbf{N}$ , which models the association between stock items and the current number in stock of product. *Supplies* is a relation over  $suppliers \times products$  which models the relation between a supplier and the product that is delivered by that supplier. If the current value of these relations are following:

$price = \{(nut, 5), (bolt, 13), (screw, 3), (board, 25), (fastener, 23)\},$

$in\_stock = \{(nut, 700), (bolt, 2200), (screw, 55), (board, 0), (fastener, 600)\},$

$supplies = \{(Thomas, nut), (Thomas, bolt), (Wilks, bolt), (Wilks, screw), (Wilks, board), (Wilks, fastener), (Rogers, board), (Rogers, fastener)\},$

then what is the value of the following expressions?

- $\{nut, bolt\} \triangleleft price$
- $dom(price \triangleright 1 \dots 15).$
- $rng(price \triangleright 1 \dots 10).$
- $dom(supplies; (in\_stock \triangleright \{0\})).$

- v.  $\text{price} \oplus \{(\text{hanger}, 5), (\text{screw}, 7)\}$
- vi.  $\text{dom}(\text{supplies}; (\text{price} \geq 5 \dots 25))$ .
- vii.  $\text{supplies} \mid \{\text{Rogers}, \text{Wilson}\} \mid$ .
- viii.  $((\text{supplies}; \text{price}) \triangleright 1 \dots 15) \mid \{\text{Robinson}, \text{Rogers}\} \mid$ .
- ix.  $\{\text{Thomas}\} \leq \text{supplies}$ .
- x.  $(\text{in\_stock} \triangleright \{0\}) \mid \{\text{nut}, \text{bolt}\} \mid$ .

**Question 2:**

**[Marks: =10]**

Suppose *owns* and *can\_read* are relations over *user*  $\times$  *files* and their current values are

*owns* = {(Roberts, archive), (Wilson, tax), (Roberts, summary), (Jones, old)}

*can\_read* = {(Roberts, archive), (Wilson, archive), (Wilson, tax), (Jones, tax), (Roberts, summary), (Jones, old), (Jones, archive)}.

Indicate which of the following predicates are true and which are false.

- i.  $(\text{Jones}, \text{tax}) \in \text{owns} \wedge (\text{Roberts}, \text{archive}) \in \text{can\_read}$ .
- ii.  $\text{owns} \subset \text{can\_read}$ .
- iii.  $\#\text{owns} = 7$ .
- iv.  $\text{dom } \text{owns} = \text{dom } \text{can\_read}$ .
- v.  $\text{Thomas} \in \text{owns} \vee \text{Ince} \in \text{dom } \text{can\_read}$ .
- vi.  $\text{dom } \text{owns} \cap \text{dom } \text{can\_read} \neq \{\text{Wilson}, \text{Timms}\}$ .
- vii.  $\text{dom } \text{owns} \cap \{\text{Timms}\} = \{ \}$
- viii.  $\text{dom } \text{owns} \cap \{\text{Timms}\} \neq \{\text{Wilson}, \text{Timms}\}$ .
- ix.  $\#\text{can\_read} > 7$ .
- x.  $\{(\text{Roberts}, \text{archive})\} \cup \{(\text{Wilson}, \text{tax})\} \subset \text{can\_read}$ .