**Formal Methods**

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**Section:** A

**Assignment:** 02

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**Question: 01**

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 x 1...30, which models the association between prices and stock items. In\_stock is a relation over products x N, which models the association between stock items and the current number in stock of product. Supplies is a relation over suppliers x 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?

1. **{nut, bolt}\dres price**

= {(nut, 5), (bolt ,13)}

1. **dom(price \nrres 1...15).**

= dom({(board, 25), (fastener, 23)})

= {board, fastener}

1. **rng(price \rres 1...10).**

= rng({(nut, 5), (screw, 3)})

= {5, 3}

1. **dom(supplies; (in\_stock \rres {0})).**

= dom({(Wilks, 0),(Rogers, 0)})

= {Wilks, Rogers}

1. **price ⊕{(hanger,5), (screw,7)}**

= {(nut, 5), (bolt, 13), (screw, 7),

(board, 25), (fastener, 23), (hanger, 5)},

1. **dom(supplies;(price \nrres 5...25)).**

= {Wilks}

1. **supplies (| Rogers, Wilson |)**

= {board, fastener}

1. **((supplies; price) \rres 1...15) (| {Robinson, Rogers}|)**

= (({(Thomas, 5), (Thomas, 13), (Wilks, 13), (Wilks, 3), (Wilks, 25), (Wilks, 23), (Rogers, 25), (Roger, 23), ()}**\rres** 1….15), (| {Robinson, Rogers} |)

= ({(Thomas, 5), (Thomas, 13), (Wilks, 13), (Wilks,3)}) (| {Robinson, Rogers} |)

= {}

1. **{Thomas}\ndres supplies.**

= {(Wilks, bolt), (Wilks, screw), (Wilks, board), (Wilks,

fastener), (Rogers, board), (Rogers, fastener)},

1. **(in\_stock \rres{0}) (| { nut, bolt }|) .**

= {(board, 0)}(| {nut, bolt} |)

= {}