A large manufacturer of corn seed, Hybrids Unlimited, operates p = 10 facilities producing seeds

of q = 20 hybrid corn varieties and distributes them to customers in t = 30 sales regions. After

considerable effort, a variety of parameters have been estimated:

• the cost per bag of producing each hybrid at each facility

• the corn processing capacity of each facility in bushels

• the number of bushels of corn that must be processed to make a bag of each hybrid

• the number of bags of each hybrid demanded in each customer region

• the cost per bag of shipping each hybrid from each facility to each customer region

They want to know how to carry out production and distribution operations at minimum cost.

Indexed Sets:

i = facility number (i = 1, …, p)

j = hybrid corn number (j = 1, …, q)

k = region number (k = 1, …, t)

Data

Cij = cost of producing bag of hybrid j at facility i

Ui = processing capacity of facility i

bj = number of bushels to make bag of hybrid j

djk = demand of hybrid j in region k

Sijk = cost to ship hybrid j from facility i to region k

Decision Variables

Xij = production amount of hybrid j at facility i

Yijk = amount of hybrid j shipped from facility i to region k

Objective:

Min Cost – Σ Σ 𝐶!"𝑥!" + Σ Σ Σ 𝑆!"#𝑦!"#

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Constraints:

Σ 𝑏"𝑥!" ≤ 𝑈! ∀ 𝑖 '"

%& (Capacity Constraints)

Σ 𝑦!"# = 𝑑"#

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%& ∀ 𝑗 𝑎𝑛𝑑 𝑘 𝑝𝑎𝑖𝑟𝑠 (Demand Constraints)

Σ$ 𝑦!"# = 𝑥!" ∀ 𝑖 𝑎𝑛𝑑 𝑗 𝑝𝑎𝑖𝑟𝑠

#%& (Flow Constraints)

𝑋𝑖𝑗 ≥ 0 ∀ 𝑖, 𝑗 𝑝𝑎𝑖𝑟𝑠 𝑌𝑖𝑗𝑘 ≥ 0 ∀ 𝑖, 𝑗, 𝑘 𝑝𝑎𝑖𝑟𝑠 (Non-Negativity)