**CS 451**

**Activity 16-3 - Solutions**

Let xi = 1 if server i is included in the initial set.

 xi = 0 otherwise

Then appropriate IP is

 max z = 3x1 + 2x2 + 2x3 + x4 + 3x5 + 3x6 + x7

 s.t. x1 + x3 + x5 + x7≥4 (service 1)

 x3 + x4 + x5 + x6 + x7≥2 (service 2)

 x2 + x4 + x6≥1 (service 3)

 x1 + x2 + x3 + x4 + x5 + x6 + x7 = 5 (five servers in the initial set)

 3x1 + 2x2 + 2x3 + x4 + 3x5 + 3x6 + 3x7≥10 (CPU power)

 3x1 + x2 + 3x3 + 3x4 + 3x5 + x6 + 2x7≥10 (Memory)

 x1 + 3x2 + 2x3 + 3x4 +3x5 + 2x6 + 2x7≥10 (Number of users)

 x6 + x3≤1

 ‑x4‑x5 + 2≤2y (If x2>0 then x4 + x5≥2)

 x2 ≤2(1‑y)

 x2 + x3≥1

 x1,x2,...x7,y are all 0‑1 variables