

QUIZ 4

1. A special operations unit is looking to buy new weapons for use in upcoming deployments. There are four weapons available that can effectively engage targets at different ranges. The different weapons, their costs, and capabilities are summarized in the table below. A YES in the column for a weapon means that it can effectively engage targets at that range.

| Target Range | Weapon 1 | Weapon 2 | Weapon 3 | Weapon 4 |
|--------------|----------|----------|----------|----------|
| Short | YES | YES | YES | YES |
| Medium | NO | YES | YES | NO |
| Long | NO | NO | YES | YES |
| Cost | \$ 6300 | \$ 5400 | \$ 4600 | \$ 3100 |

Use the variable x_j defined below, to answer the following questions. Remember to define **ANY** other terms you use in your answers to the questions below.

$$x_j = \begin{cases} 1 & \text{if Weapon } j \text{ is selected} \\ 0 & \text{otherwise.} \end{cases}$$

- (a) (5 Points) Write an objective function that finds a minimum cost collection of weapons. (4 points for no-sets version + 1 point for sets version.)

- (b) (*5 Points*) Write the set covering constraints which ensure the unit will have **AT LEAST ONE** weapon that can effectively engage targets at each range. (4 points for no-sets version + 1 point for sets version.)

- (c) (*5 Points*) Write the set partitioning constraints which ensure the unit will have **EX-ACTLY ONE** weapon that can effectively engage targets at each range. (4 points for no-sets version + 1 point for sets version.)