**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG511 Optimization Theory**

**HOMEWORK 3 Spring 2017-18**

1. Consider the following linear programming problem



1. Find the optimal solution by evaluating the objective function at all extreme points of the constraint set.
2. Suppose that the first constraint is replaced by . Can the same approach for finding the optimal point be used? Explain why.
3. Consider a minimization linear programming problem with extreme point **x**1, **x**2, **x**3 and **x**4, and extreme direction **d**1, **d**2 and **d**3, and with an objective function gradient **c** such that **cx**1=4, **cx**2=6, **cx**3=3, **cx**4=6, **cd**1=3, **cd**2=0, and **cd**3=6. Characterize the set of alternative optimal solutions to this problem.
4. Find all extreme point and extreme direction of the following polyhedral set



Represent ***x****=(1,1,1)* as a convex combination of the extreme points of *X*.

1. Determine the extreme points of the following set. Is there any recession direction for *X* ?



1. Use the Representation Theorem and rewrite the following two linear programming problem in terms of ’s and ’s and discuss about optimal solution. Find the Optimal solution for the mention problems (if any).



1. Answer to the following question and provide a brief explanation or illustration.
2. Is it possible for to be empty but associated direction set *D* to be nonempty?
3. Is there a relationship between redundancy and degeneracy of a polyhedral set?
4. Dose degeneracy implies redundancy in tow dimensions?
5. If the intersection of a finite number of half spaces in nonempty, then this set has at least one extreme point. True or false?
6. An unbounded *n-*dimensional polyhedral set can have at most *n* extreme directions. True or false?
7. What is the maximum (actual) dimension of  where *A* is the *m* by *n* of rank *t,*?
8. Use the Representation Theorem and rewrite the following linear programming problem in terms of ’s and ’s and discuss about optimal solution. Find the Optimal solution (if any).



1. Consider the following system
2. 
   1. Find extreme points and extreme directions of the feasible region which imply from above system.
   2. Consider two minimization linear programming problems whose result using following two linear functions as objective function respectively.



Use Representation Theorem and reformulate these linear programming to the problems in terms of the extreme points and extreme directions and find the optimal solution for each problem.

* 1. Sketch the feasible region and point out the region that if cost coefficients vector C placed in this region the problem always have unbounded optimal solution.