IKU-ENG 004 ALGORITHM AND INT. TO PROGRAMMING
TAKE-HOME FINAL EXAM

Surveying and Earthwork calculations are one of the major subjects in Civil Engineering education.

The following questions are actually in the subject of Surveying and Highway Design classes. All the ENG004 students are supposed to solve the question those are given parametric upon the ID numbers, by using MATLAB program. The solutions should be reported in MS Word in engineering manner and format and the brief summary of the report should be prepared by using MS PowerPoint.

The deadline for the submission is *June 14th, 2006 Wednesday 1100 hrs* to R.A. Ahmet Anıl Dindar (D225) or Gökhan Yazıcı (D223) in CE department corridor. The report and the CD that contains the files are to be given in.

The parameters of the questions are determined as followed,

Student ID	a	b	c	d	e	f	g	h	i	j

Parameters are $\alpha = b + d + h + i + j$ and $\beta = b + g + 2*i + j$
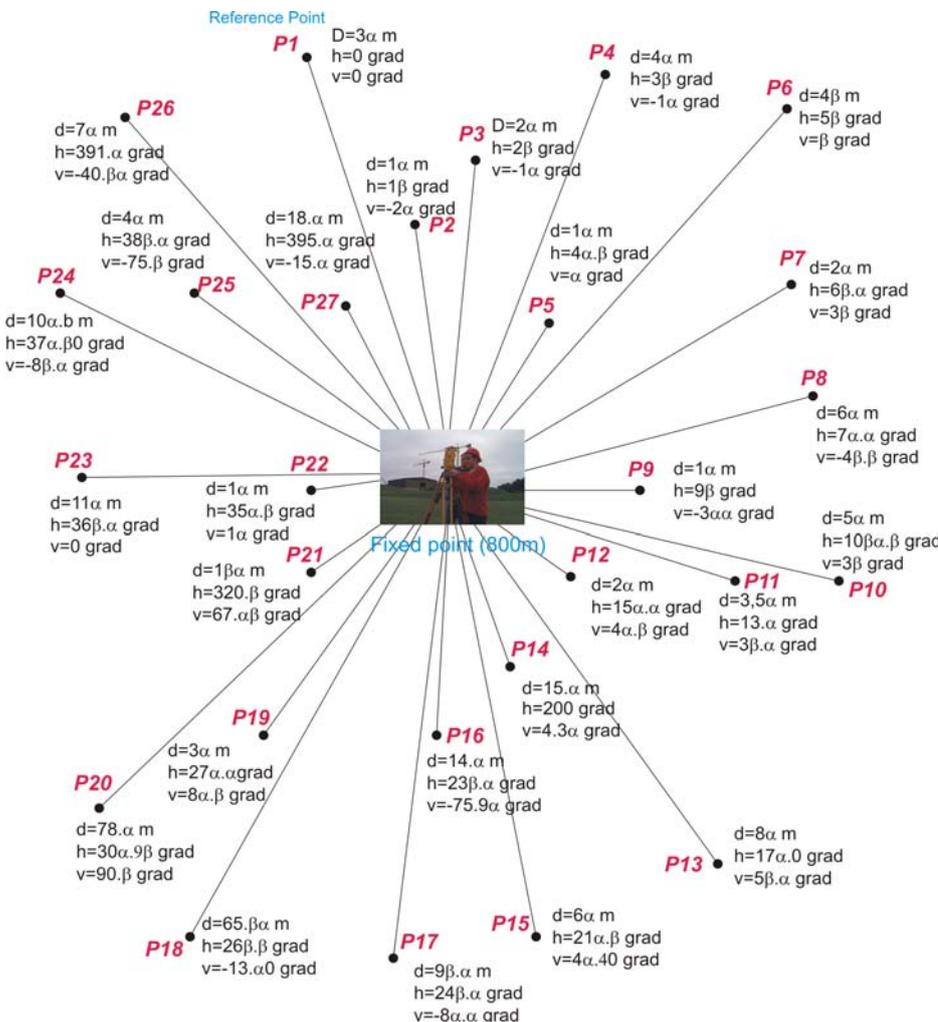α and β is actually the last digit of the summations
(i.e. α=14→α=4 or β=20→β=0)

Question 1/2:

The topographic surveying is very important before starting a engineering project on the site. The earth surface must be obtained in order to see the situation. Therefore geodetic measurement is performed by using optical gadgets named as "theodolite". This gadget gives the horizontal distance and horizontal and vertical angle of a specific point with respect to a reference point (P1 for you). The angles of the measurement are in "grad" and the distance between the fixed point and points are in "meter". The elevation of the fixed point is *800m* above the sea level.
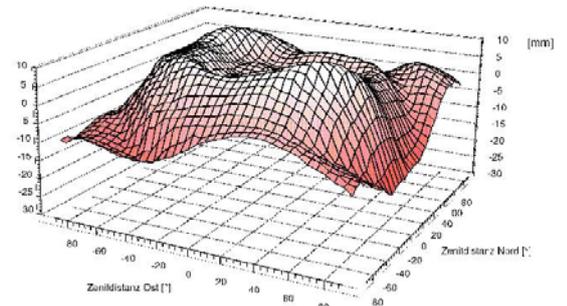
You are supposed to derive the surface model of a geodetic study sketched below by using MATLAB. To do it, you should make a data file, probably a txt file filled with the numbers you acquired the sketch below and than write a code producing the *3D surface model (graphic)* that may be exampled alike the right.

HINT: Think about the Polar and Cartesian Coordinates

Reference Point
P1   D=3α m   h=0 grad   v=0 grad

P4   d=4α m   h=3β grad   v=-1α grad

P6   d=4β m   h=5β grad   v=β grad

P26   d=7α m   h=391.α grad   v=-40.βα grad

P3   D=2α m   h=2β grad   v=-1α grad

P2   d=1α m   h=1β grad   v=-2α grad

d=4α m   h=38β.β grad   v=-75.β grad

d=18.α m   h=395.α grad   v=-15.α grad

d=1α m   h=4α.β grad   v=α grad

P7   d=2α m   h=6β.α grad   v=3β grad

P24   d=10α.b m   h=37α.β0 grad   v=-8β.α grad

P25   P27   P5

P8   d=6α m   h=7α.α grad   v=-4β.β grad

P23   d=11α m   h=36β.α grad   v=0 grad

P22   d=1α m   h=35α.β grad   v=1α grad

P9   d=1α m   h=9β grad   v=-3αα grad

d=5α m   h=10βα.β grad   v=3β grad

Fixed point (800m)

P21   d=1βα m   h=320.β grad   v=67.αβ grad

P12   d=2α m   h=15α.α grad   v=4α.β grad

P11   d=3,5α m   h=13.α grad   v=3β.α grad

P10

P14   d=15.α m   h=200 grad   v=4.3α grad

P19   d=3α m   h=27α.αgrad   v=8α.β grad

P16   d=14.α m   h=23β.α grad   v=-75.9α grad

P20   d=78.α m   h=30α.9β grad   v=90.β grad

d=8α m   h=17α.0 grad   v=5β.α grad

P13

P18   d=65.βα m   h=26β.β grad   v=-13.α0 grad

P17   d=9β.α m   h=24β.α grad   v=-8α.α grad

P15   d=6α m   h=21α.β grad   v=4α.40 grad

Question 2/2:

Earthwork is very important in many Civil engineering projects, such as highway, pipeline construction. There are many criteria you will see in the classes of Surveying and Transportation Engineering. However it is simple to do some calculations for the cross-sections given below.

The below sketches are typically earthwork cross-sections. These cross-sections are taken every *25 meter* in a road construction. The main aim is to calculate the volume of the soil to be carried in or away to fill or cut the earth.

Your duty is to calculate the areas of the cut and fill sections of each cross-section and the volumes of the soil between the cross-sections by using MATLAB. First you have to create a data file filled with the coordinates of the cross-section. Then, write a MATLAB code to calculate the areas of the cross-sections and the volumes between the cross-sections.

HINT: Think about how to calculate the area of polygon defined by its corner coordinates.