THE KENYA POLYTECHNIC UNIVERSITY

COLLEGE

DEPARTMENT OF SURVEYING & MAPPING

HIGHER DIPLOMA IN LAND SURVEY

END OF YEAR I EXAMINATIONS

NOVEMBER 2007

PHOTOGRAMMETRY & REMOTE SENSING

3 HOURS

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

Answer booklet

Scientific calculator

Answer any FIVE of the following SEVEN questions.

All questions carry equal marks and the maximum marks for each part of a question are as shown.

This paper consists of **3** printed pages.

1. Exterior orientation of a single photograph is an important problem in photogrammetry.
   (a) Define the objective of that orientation. (4 marks)
   (b) State the number and the nature of the elements of such orientation. (4 marks)
   (c) Write down the mathematical model to be used in solving this problem. (4 marks)
   (d) Explain the different parameters in this model. (4 marks)
   (e) Indicate, giving reasons, the required number of control points and their favourable locations to solve the problem. (4 marks)
2. Semi-analytical aerial triangulation by independent models is widely used in developing countries as it makes use of available stereoplotters and modern computational devices.
   (a) State the advantages of this method as compared with the analogue method. (5 marks)
   (b) Write down the mathematical formula which enables joining the independent models to form continuous and homogeneous network of aerial triangulation. (5 marks)
   (c) Explain the different parameters of the formula in (b). (5 marks)
   (d) Show, giving reasons, which points should be measured in each model. (5 marks)
3. (a) Write down the parallax equations for calculating, in a suitable photogrammetric system, the ground coordinates of object points from the measured coordinates of its images on a terrestrial pair of photographs according to the normal case. (5 marks)
   (b) Apply the equations in (a) to calculate the ground coordinates of a point given the following: Photo base = 138.29m, principal distance of camera = 168.32mm; elevation of left and right cameras is 1534.68m; image

coordinates on left camera $x_1 = +20.25mm,\ z_1 = -16.41mm$; image coordinates on right camera $x_2 = -47.55mm,\ z_2 = -16.41mm$. (7 marks)

(c) Estimate the accuracies of the calculated coordinates in (b). (8 marks)

4. (a) Discuss the different interaction mechanisms of electro-magnetic radiation with atmosphere. (15 marks)

   (b) State the main atmospheric windows available for remote sensing. (5 marks)

5. Discuss, giving examples, the concept of resolution of a remote sensing system. (20 marks)

6. (a) Explain the purpose of "adjusting" aerial triangulation. (2 marks)

   (b) State the sources of errors in aerial triangulation. (4 marks)

   (c) Describe the method of adjusting a long strip of aerial triangulation by using polynomials, given sufficient control points. (14 marks)

7. Discuss, giving examples, the different characteristics of analogue images, which could be used as criteria for photo-interpretation. (20 marks)

8. In a spatial block adjustment of aerial triangulation network, the planimetric accuracy is not affected by the layout of height control, and the height accuracy is independent on the layout of the planimetric control.
   Discuss the resulting accuracy in plan and in height in relation to the density of control points. (20 marks)