Bessface

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School of Engineering

Department of Geomatic Engineering

2013 ACADEMIC YEAR

SECOND HALF TERM 3 TEST - MAY 2014

COURSE NAME: **PHOTOGRAMMETRY I**

COURSE CODE: **GEO 3322**

TIME: **TWO (2) HOURS**

TOTAL MARKS: **100**

INSTRUCTIONS

1. **Answer: ALL FOUR** (4) QUESTIONS from SECTION A and ANY **ONE QUESTION** from SECTION B

2. This TEST is Closed Book

3. Calculators are permitted

4. Show all the work leading to the solution

SECTION A

Question 1

a) Define briefly, the following photographic terms:

- F-number
- Nadir point
- Principle distance
- Flying height
- Fiducial marks
- Brightness factor

b) The image distance for a photograph of an object, which is located 4.5 meters from the camera, is 76.5mm. What image distance is required for perfect focus if the object is in infinity?

c) An aerial camera makes an exposure at a shutter speed of 1/1,000 sec. If the aircraft speed is 500 miles per hour, how far will the aircraft travel during the exposure?

(12+4+4) marks

Question 2

a. Name the instrument usually employed to measure the position of a point in a photograph.

b. What are the systematic errors contained in the measured photo-coordinates, that disturb the ideal linear relation between the perspective center, the image point and the ground point?

(4+16) marks

Question 3

a) What is meant by a vertical photograph?

b) What are the effects of tilt and relief displacement on a photo?

c) A vertical photograph captured at a flight height of 2000' above sea level shows a radio tower with a base elevation 540' above the same datum. The image of the

tower has a relief displacement of 1.33". The distance from the photograph' s principal point to the top of the tower is 5.97". What is the height of the tower?

$h = \frac{H \cdot b}{r}$

(4+8+8) marks

Question 4

a) Describe the meaning of photosensitivity and spectral sensitivity of photographic material.

b) What are the relationships between?

- F-number and shutter speed
- Film speed and emulsion grain size
- Resolution and emulsion grain size

c) Mention and explain one of the methods of camera calibration.

(4+6+10) marks

SECTION B

Question 5

The figure below shows an overlapping pair of truly vertical aerial photographs taken at equal flying height H above mean sea level (MSL) and having equal focal lenths f. The corresponding images of the ground point P are P_L on the left photo and P_R on the right photograph, respectively. The ground coordinate system XYZ has its origin at the MSL level location O of the left photo camera exposure station, i.e. the **X** and **Y** axes are parallel to the x and y axes of the photo system.

a) Derive the basic parallax equations for the ground coordinates of point P based on the illustrated geometry of the overlapping truly vertical photos.

b) Compute the ground coordinates $\mathbf{X_pY_pZ_p}$ of point **P** using the previously derived parallax equations for the photo stereo pair, whose
focal length **f**=152mm, the air base **B**=1815m and the flying height **H**=3000m;
and the photo-coordinates of point **P** are:
for the left photo: x_L = +80.00mm y_L = -50.00mm, and
for the right photo: x_R = -20.00mm, y_R = -50.00

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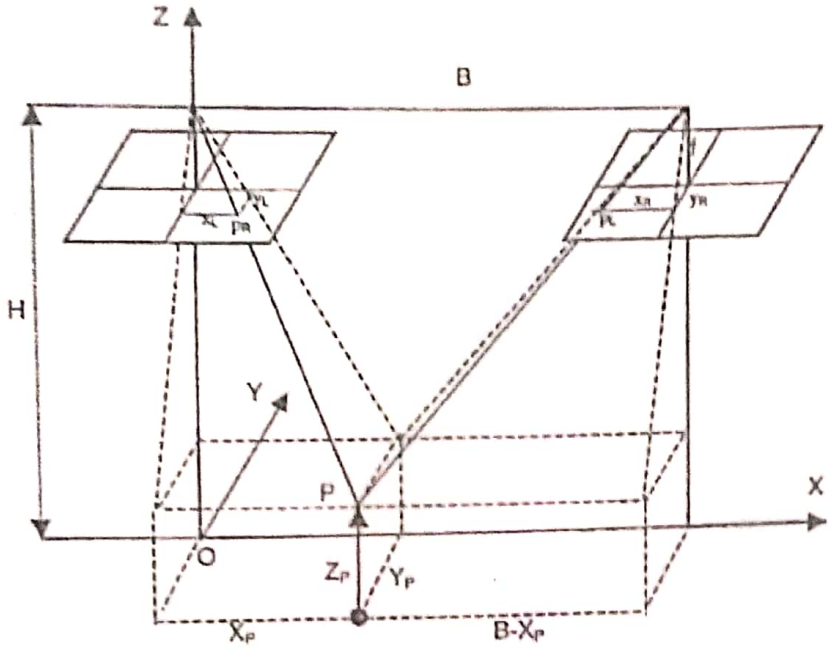

(14+6) marks

Question 6

The image coordinates of three points **A, B, C** and of the principal points **P** and **Q** on two overlapping vertical aerial photos were as follows

Point	Left photo		Right photo	
	x(mm)	y(mm)	x(mm)	y(mm)
P	0.0	0.0	-89.2	0.0
Q	+89.4	0.0	0.0	0.0
A	+12.8	+44.6	-76.6	+44.2
B	+16.4	+6.3	-72.8	+5.9
C	+20.2	-30.7	-69.6	-31.2

Given that the ground coordinates of A and C were 60,000mE, 72000mN and 61260mE, 71200m N respectively, estimate those of **B**.

(20) marks