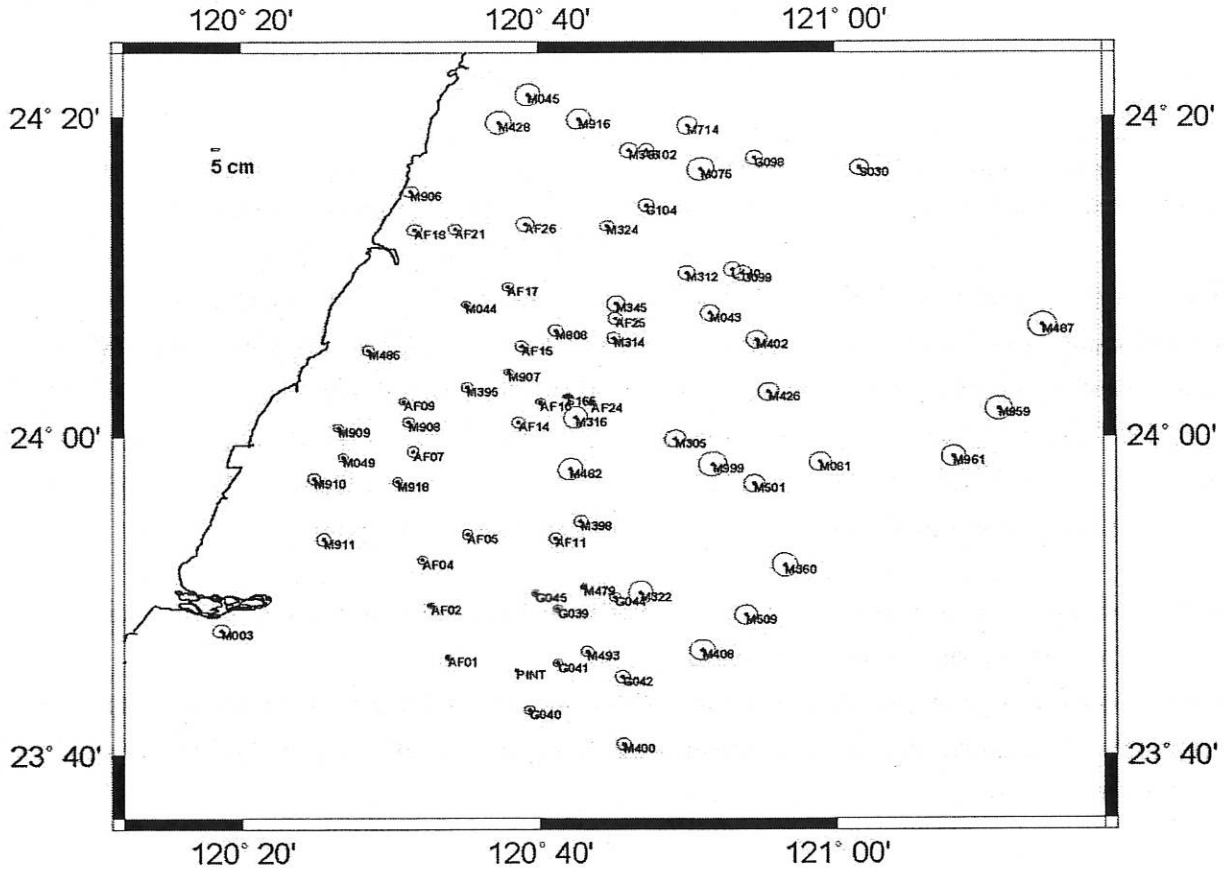
國立交通大學 104 學年度第 1 學期

博士班資格考筆試考試試題

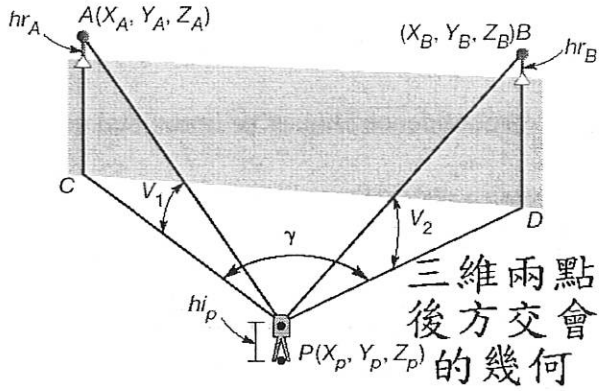
土木工程學系 測量組(戊)　科目：**基礎科目(測量學、測量平差)**　選考學生數：2　考試時間: 120min

Closed book exam

1. The following figure shows 95% confidence ellipses of horizontal coordinates derived from a GPS campaign in central Taiwan.
   (a) What is the difference between a confidence ellipse and an error ellipse? (15%)
   (b) What conclusion can you draw from the map of confidence ellipses? (15%)



2. In a problem of three-dimensional two point resection, angles (v_1, v_2,γ) and slant ranges (S_{PA} and S_{PB}) were measured by a total station. The coordinates of stations A and B were (X_A, Y_A, Z_A) and (X_B, Y_B, Z_B). The instrument heights were h_A, h_B and h_P. Please provide detail equations to determine the three dimensional coordinates of P (15%).



3. (a) Define the radial traversing; (b) State the advantages and disadvantages of radial traversing; (c) Explain the reasons of using two instrument stations when running radial traverse. (15%)

4. Please design a four station traverse with specific numerical values of the coordinates and observed angles and distances. The angles should not be zero degree or 180 degree exact. The distances should not be zero either. Two stations of these four have known coordinates. The figure of this traverse is not limited, but has to be able to provide redundant observation for adjustment. The designed traverse should be as close to a real case as possible. Please tabulate the observations, illustrate with drawing, and perform the following tasks. (40%)

   (a) Please apply the "traverse computation" scheme, that is, adjust the angles first and then the rest, to the numerical example designed.
   (b) Please use the Least Squares method to perform adjustment for the same numerical example.
   (c) Please compare the uncertainty assessment procedure and result of the two schemes, i.e., "traverse computation" and the "Least Squares".

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土木工程學系 測量組(戊)　科目：專業科目(衛星大地)　選考學生數：1　考試時間: 60min

Open Book.

1. Recent technical progress in satellite radar altimetry has made possible applications of satellite altimetry to land subsidence monitoring and mountain glacier change detection. Show
   (1) The principle of satellite **radar** altimetry. (note: not laser altimetry). (15%)
   (2) What is required to make land observations from radar altimetry **precise enough** for applications to land subsidence and mountain glacier. (15%)
2. List and discuss the factors that affect the accuracy of vertical coordinate component in GPS positioning. (20%).
3. (a) List the perturbing forces acting on a satellite that is about 800 km above the earth surface. (10%)
   (b) Which is the dominant perturbing force? (10%)
   (c) In kinematic orbit determination using GPS observations on a near-earth satellite, the perturbing forces are no longer concerned. Why? (10%)
4. Compare the following times: Sidereal time and Universal Time. (20%)

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博士班資格考筆試考試試題

土木工程學系 測量組(戊) 科目：**專業科目(攝影測量及遙測學)** 選考學生數：1 考試時間：120min

Closed book exam

1. Please describe and illustrate with drawing for what is "depth of field", and derive the relation between "depth of field", focal length and lens opening. If f=75 mm, C=0.05mm, pA=5m, F=5.6, where f is the focal length, C is diameter of the confusion circle, pA is the object distance, F is the aperture, what is the "depth of field" (30%)?

2. What is meant by "field of view" and "instantaneous field of view"? Please describe it and illustrated with drawing. (20%)

3. Please answer the following questions in orientation modelling (20%):
   (a) What is bundle adjustment with self-calibration?
   (b) What are the differences between (1) bundle adjustment and (2) relative and absolute orientations ?

4. Please answer the following questions in image classification (15%):
   (a) Please provide the algorithm of ISODATA.
   (b) Please compare the ISODATA and K-means.
   (c) How to reduce the effects of salt and pepper phenomena in classification?

5. What are the differences between optical and microwave sensors? (Hints: resolution, acquisition, geometric, radiometric, application,……) (15%)

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博士班資格考筆試考試試題

土木工程學系 測量組(戊)　科目：專業科目(物理大地)　選考學生數：1　考試時間：60min

OPEN BOOK

1. When the geoid is to be determined gravimetrically, the gravity anomaly data need to go through some reductions before the Stokes' integral is carried out. (1) Why the gravity reduction is necessary for the Stokes' integral? (2) Give an example of gravity reduction for geoid determination; elaborate the process related to gravity reduction through gravity data and the geoidal undulation output (3) Elaborate on the concerns (potential problem) involved in the method you propose. (4) What is the indirect effect? How to deal with the indirect effect in the case of gravity reduction you suggest? (You may combined your answer for this question into question (2)) (25%)

2. The GRACE mission provides us a set of spherical harmonic coefficients to represent the time-varying Earth potential on a monthly basis. Elaborate on how we translate the time-varying potential into the mass change of Earth. Detailed procedures are not required; please briefly present the key equation and concept, and elaborate on the necessary constraint assumed in the method. (25%)

3. The introduction of gravity anomaly (denoted by Δg) is associated with the concept of disturbing potential (denoted by T). Consequently, the *fundamental equation of physical geodesy* is so derived in the hope that the unknown disturbing potential T can be solved by the observation Δg,

$$-\frac{\partial \mathrm{T}}{\partial n}+\frac{1}{\gamma}\frac{\partial \gamma}{\partial n}T=\Delta g \qquad (1)$$

which is an ordinary differential equation with the derivative taken on the direction of plumb line n. (γ denotes the normal gravity). What is the problem we encounter in solving this equation when gravity anomaly Δg on Earth surface is applied? How do we deal with this problem to get a solution for T? (25%)

4. The orthometric height H at a point P is defined by

$$H=\frac{C}{\overline{g}} \qquad (2)$$

where C denotes the geopotential number of point P. How do we determine the mean gravity $\overline{g}$ in (2)? What is the associated problem of the way you determine the mean gravity $\overline{g}$? (25%)