

# 國立陽明交通大學 109 學年度第 2 學期

## 博士班資格考筆試考試試題

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

共 1 頁，第 1 頁  
本試題卷需回收

1. In the least-squares solution of the GMM model,  $V=AX-L$ , show that  $A^T PV = 0$ . (15%)

2. Explain the following terms:

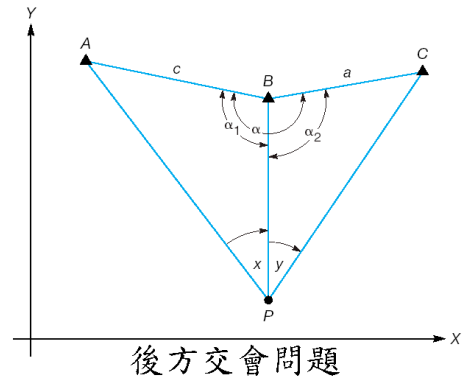
(a) Idempotent matrix. (10%)

(b) Generalized inverse of a matrix. (10%)

3. In a problem of three-point resection, angles ( $\angle x$  and  $\angle y$ ) were measured by a Theodolite. The coordinates of stations A, B and C were  $(X_A, Y_A, Z_A)$ ,  $(X_B, Y_B, Z_B)$ , and  $(X_C, Y_C, Z_C)$ , respectively.

(a) Please provide detail equations to determine the coordinates of P (15%).

(b) What is danger circle (危險圓) in three-point resection? How to avoid it? (5%)



4. What is High-definition map (HDMaP) in Surveying? Please explain briefly the concepts, contents, applications, and challenges. (15%)

5. Please draw the basic surveying configurations of leveling and triangle elevation, respectively. Please indicate the observations and label the meaning of each symbol. (5%)

6. Assume an electronic distance measuring device conveys the uncertainties of centering error (3 mm) and prism pointing error (2 mm). Also, the ranging accuracy is  $2\text{mm}+2\text{ppm}$ . Please give the ranging accuracy at the distance of 910.421 m. (10%)

7. Five traverse points are set as A, B, C, D, E, in which the azimuth of AB is  $10^\circ 12' 30''$ . C locates at the west of B. Assume the interior angles:  $A = 77^\circ 23' 28''$ ;  $B = 143^\circ 35' 18''$ ;  $C = 84^\circ 20' 10''$ ;  $D = 151^\circ 59' 36''$ ;  $E = 82^\circ 41' 38''$ . Please give the azimuth of  $A_{CD}$  after adjustment? (10%)

8. Please draw a flow chart to explain the iterative processes of the indirect observation method. Annotation of each diagram should be provided. (i.g., Step 1: define the objective function; Step 2: linearization...) (5%)