

National Exams December 2002

**98-Geom-A1, Plane Surveying & Elementary Photogrammetry**

(3 hours duration)

NOTES:

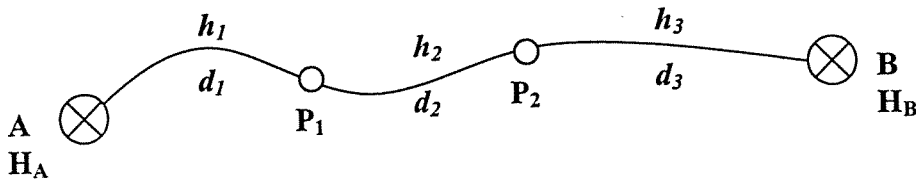
1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM. Any Sharp or Casio approved calculators are permitted.
3. FIVE (5) questions constitute a complete exam paper. The first five questions as they appear in the answer book will be marked.
4. Each question is of equal value.

## 98-Geom-A1 Plane Surveying and Elementary Photogrammetry

Candidate ID: \_\_\_\_\_ Name: \_\_\_\_\_ Signature: \_\_\_\_\_

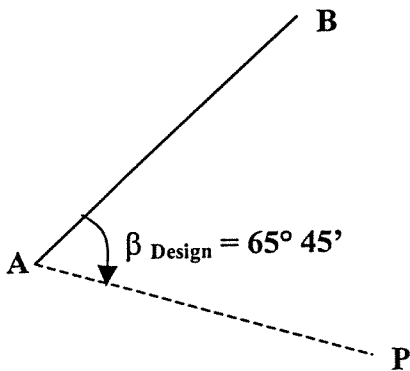
**Give answers to any five (5) of the following seven questions (100% total, 20 marks each).**

- Given a simple leveling circuit as illustrated in the following figure, demonstrate the complete adjustment procedure of this leveling circuit. The procedure should result in the final elevations of point  $P_1$  and  $P_2$ . (20 marks)



$h_i$  – height difference ( $i = 1, 2, 3$ )       $d_i$  – leveling distance ( $i = 1, 2, 3$ )  
 $H_A, H_B$  – known elevations for point A and B

- Describe a simple peg test method used to test and calibrate the collimation error of a level (Note: you must use necessary diagrams and equations to support your description). (20 marks)
- Describe procedures to layout a designed horizontal angle  $\beta_{\text{Design}}$ . Use the values given in the following figure to facilitate your description. (20 marks)



4. A rectangular project area 3 km in the north-south direction and 4 km in the east-west direction is to be photographed at a scale of 1:3000. End lap and side lap are to be 60% and 30%, respectively, and the camera format is  $23 \text{ cm}^2$ . Compute the total number of photographs needed to cover this area, assuming that flight lines will run east-west and that the first and the last lines will be flown so that the adjusted side lap will extend outside the project boundaries. Add two photos at the ends of each strip to ensure complete coverage. (20 marks)
5. Calculate the stereoscopic parallaxes of points A through D, given the following measured flight-line axis coordinates. Which point is the highest in elevation? Which is lowest? (20 marks)

Point	x (left photo)	x' (right photo)
A	59.9 mm	-27.2 mm
B	68.0 mm	-21.6 mm
C	99.6 mm	9.9 mm
D	100.4 mm	8.5 mm

6. Calculate the approximate vertical exaggeration in a stereomodel from photos taken with a 152 mm focal length camera having a  $23 \text{ cm}^2$  format if the photos are taken at 55% end lap. (20 marks)
7. A pair of overlapping vertical photos is taken from a flying height of 1835 m above the base of a radio tower. The  $x$  coordinates on the left photo of the top and base of the tower were 96.5 mm and 90.5 mm, respectively. On the right photo these  $x'$  coordinates were  $-1.1 \text{ mm}$  and  $-1.0 \text{ mm}$ , respectively. Calculate the approximate height of the tower. (20 marks)