

December 2005 Technical National Exams

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.

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

1. The direct and reversed directions observed with a total station instrument from *A* to points *B*, *C*, and *D* are listed in the following table,

Direct	0°00'00"	106°52'06"	191°38'43"	359°59'58"
Reversed	0°00'00"	106°52'04"	191°38'41"	0°00'00"

Determine the values of the three angles and the horizon misclosure. **[20 marks]**

2. Five interior angles of a six-sided closed-polygon traverse were measured as: $A = 43^\circ 17' 08''$, $B = 202^\circ 04' 57''$, $C = 103^\circ 33' 44''$, $D = 98^\circ 35' 15''$, and $E = 132^\circ 23' 59''$. The angle at *F* was not measured. If all measured angles are assumed to be correct, what is the value of angle *F*? **[20 marks]**
3. Differential leveling between BMs *A*, *B*, *C*, *D*, and *A* gives elevation differences (in metres) of -15.632, 32.458, 38.214, and -55.025, and distances in km of 4.0, 6.0, 5.0, and 3.0, respectively. If the elevation of *A* is 634.597 m, compute the adjusted elevations of BMs *B*, *C*, and *D*, and the order of leveling. **[20 marks]**
4. Aerial photography was taken at a flying height of 4500 ft above average terrain. If the camera focal plane dimensions are 9×9 in, the focal length is 152.4 mm and the spacing between adjacent flight lines is 4700 ft, what is the percent sidelap? **[20 marks]**
5. Aerial photographs at a scale of 1:6,000 are required to cover an area of 6 square miles. The camera has a focal length of 152.4 mm and focal plane dimensions of 9×9 in. If endlap is 60% and sidelap 30%, how many photos will be required to cover the area? **[20 marks]**

6. An airbase of 3205 ft exists for a pair of overlapping vertical photographs taken at a flying height of 5500 ft above MSL with a camera having a focal length of 152.4 mm. Photo coordinates of points *A* and *B* on the left photograph are $x_a = 40.50$ mm, $y_a = 42.80$ mm, $x_b = 23.59$ mm, and $y_b = -59.15$ mm. The x photo coordinates on the right photograph are $x'_a = -60.68$ mm, and $x'_b = -70.29$ mm. Using the parallax equations, calculate horizontal length *AB*. [20 marks]
7. 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) (mm)	x' (right photo) (mm)
A	59.9	-27.2
B	68.0	-21.6
C	99.6	9.9
D	100.4	8.5