

May 2007 Technical National Exams

04-Geom-A1 Surveying

(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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Candidate ID: _____ Name: _____ Signature: _____

Give answers to any five (5) of the following seven (7) questions [100% total, 20 marks each].

1. In trigonometric leveling from point *A* to point *B*, the slope distance and zenith angle measured at *A* were 7929.473 m and $82^{\circ}42'50''$. At *B* these measurements were 7929.464 m and $97^{\circ}17'16''$, respectively. If the instrument and rod target heights were equal, calculate the difference in elevation from *A* to *B*.

2. Compute the linear misclosure, relative precision, and adjusted lengths and bearings for the sides after the departures and latitudes are balanced by the compass rule in the following closed-polygon traverse.

Line	Length (m)	Departure (m)	Latitude (m)
<i>AB</i>	2119.287	- 2014.119	+ 662.335
<i>BC</i>	4660.292	- 1656.601	- 4358.126
<i>CA</i>	5209.110	+ 3670.793	+ 3695.957

3. What are the geocentric coordinates (*X*, *Y*, *Z*) of a station which has a latitude of $39^{\circ}27'07.5894''$ N, longitude of $86^{\circ}16'23.4907''$ W, and height of 203.245m (use the WGS84 ellipsoid parameters: $a = 6,378,137.0$ m, $b = 6,356,752.3$ m, $f = 1/298.257$)?

4. In an as-built survey, the (*X*, *Y*) coordinates (ft) of three points on the centerline of a highway curve are determined to be *A*(3770.52, 4913.84), *B*(3580.80, 4876.37), *C*(3399.27, 4809.35). What are the radius and coordinates for the centre of the curve?

5. Use the carrier phase measurement equations to explain how the satellite and receiver clock bias, the ionospheric and tropospheric refraction, as well as the integer ambiguity be eliminated in precise GPS survey.

6. 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.

7. If an EDM instrument has a purported accuracy capability of $\pm(2\text{mm} + 2\text{ppm})$, the estimated instrument and target miscentering errors are ± 3 mm and ± 5 mm, respectively, what error can be expected in a measured distance of 2475 m?