

National Exams May 2017

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.
One of two calculators is permitted any Casio or Sharp approved model.
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.

Candidate Name:

Signature:

Give answers to any five (5) of the following seven questions (20 marks each).

1. The following table represents a differential leveling work. Prepare and complete the necessary field notes in a table for this work and calculate the elevation of the point BM2 along with a page check.

Station	BS	HI	FS	Elevation (ft)
BM1	2.45			88.00
TP1	5.43		6.53	
TP2	3.18		4.91	
TP3	4.22		7.42	
BM2			6.11	

2. Give true (T) or false (F) to the following 10 statements [2 marks each]. Note that you will have to make a right correction for the false statement to get 2 marks. If you make a wrong correction for the false statement, you will only get 1 mark.
- 1) In GPS surveys, the position of a point on the earth's surface is determined by three GPS satellites [].
 - 2) The heights obtained from GPS surveys are measured with respect to the geoid [].
 - 3) The geometric relationships among the geoid, ellipsoid, and the earth's surface can be described as that the geoidal height equals the ellipsoidal height plus the orthometric height [].
 - 4) For the circular curves having a radius $R = 900$ ft, its degree of curve by chord definition is $6^{\circ}21'58''$ [].
 - 5) If the forward azimuth and forward bearing of the line AB are 235° and $S55^{\circ}W$, respectively; then the back azimuth and back bearing of the line BA are 55° and $N55^{\circ}E$, respectively [].
 - 6) "The tangent offsets vary as the distance from the points of tangency" is one of the mathematical properties of the parabolic curve [].
 - 7) For a horizontal curve, the station of the point of curvature equals the station of the point of intersection minus the tangent distance, while the station of the point of tangency equals the station of the point of intersection plus the tangent distance [].
 - 8) For a vertical curve, the station of the point of vertical curvature equals the station of the point of intersection minus the length of the vertical curve, while the station of the point of vertical tangency equals the station of the point of intersection plus the

- length of the vertical curve [].
- 9) A traverse beginning and ending at the same known point is called a closed traverse, but a traverse starting at a known point and ending at another known point is called an open traverse [].
- 10) If the accidental error is estimated to be ± 0.006 m for each of 36 separate measurements, then the total estimated error should be ± 0.036 m [].

3. Given that the radius of a highway circular curve is 900 m, the angle between the back and forward tangents is $14^\circ 45'$, and the station of the point of intersection is 1+948.800 m, use the arc definition to compute (1) the length of the curve and the tangent distance, (2) the external distance and middle ordinate for this curve and the long chord, and (3) the stations of the point of curvature and the point of tangency.
4. A -3.00% grade meets a +5.00% grade at station 62+00, where the elevation is 600.60ft. An equal-tangent parabolic curve 800 ft long has been selected to join the two tangents. Determine (1) the station and elevation of the beginning of vertical curve, (2) the station and elevation of the end of vertical curve, and (3) the elevation of the first full station on the curve.
5. Determine (1) departures and latitudes, (2) the error of closure (or linear misclosure), and (3) relative precision of the following closed polygon.

Course	Length (m)	Azimuth	Departure	Latitude
AB	1,352.562	$245^\circ 16' 24''$		
BC	1,999.670	$147^\circ 06' 37''$		
CD	1,329.127	$95^\circ 33' 20''$		
DE	2,427.328	$23^\circ 45' 21''$		
EA	2,163.325	$274^\circ 01' 46''$		

6. Draw a sketch with a north arrow for a vacant lot based on the given bearings and measured distances: $N20^\circ W$, a distance of 294.50 m from Points A to B; $S69^\circ W$, a distance of 354.50 m from Points B to C; $S20^\circ E$, a distance of 294.50 m from Points C to D; and $N69^\circ E$, a distance of 354.50 m from Points D to A (using a 1: 5,000 map scale).
7. Given the bearings of sides AB, BC, CD, and DE, compute (1) the deflection angles and (2) the interior angles at B and D.

