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.

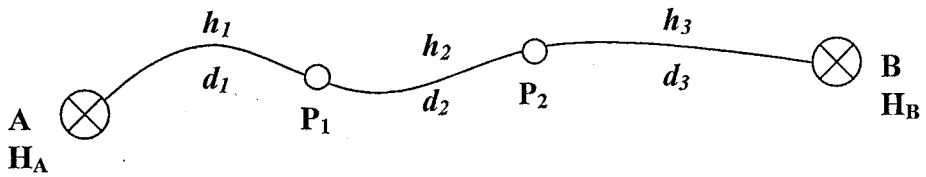
4. Each question is of equal value.

04-Geom-A1 Surveying

Candidate ID:_____ Name:_____ Signature:_____

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

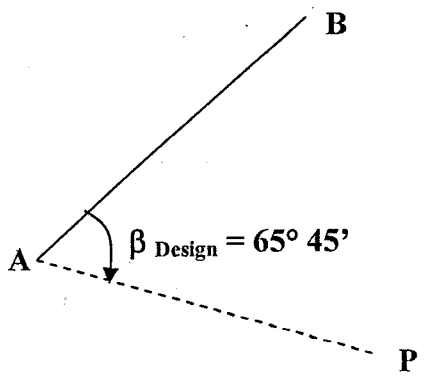
1. Given a simple leveling circuit as illustrated in the following figure, demonstrate the complete adjustment procedure of this leveling circuit. The procedure should result in the final elevations of point P_1 and P_2. (20 marks)



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

2. A differential leveling between points *A, B, C, D,* and *A* (a level loop) gives elevation differences of -15.632 m, +32.458 m, +38.214 m, and -55.025 m, and distances of 4 km, 6 km, 5 km, and 3 km, respectively. If the elevation of A is 236.891 m, compute the adjusted elevations of points *B, C,* and *D* (using weighted procedure based on the length of sections). (20 marks)

3. Describe procedures to layout a designed horizontal angle β_{Design}. Use the values given in the following figure to facilitate your description. (20 marks)



4. Determine relative weights and perform a weighted adjustment (to the nearest second) for angles A, B and C of a plane angle, given the following observations for each angle. (20 marks)

Angle A	Angle B	Angle C
38°47'54"	71°22'33"	69°50'08"
38°47'49"	71°22'27"	69°50'11"
38°48'17"	71°22'17"	69°50'39"
38°48'13"	71°22'17"	69°50'15"

5. Determine (1) departures and latitudes, (2) linear misclosure, and (3) relative precision of the following closed polygon. (20 marks)

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

6. A highway circular curve with R = 900 m, I = 14°45', and PI station = 1+948.800 m, use the arc definition to compute (1) the length of the curve (L), (2) the tangent distance (T), (3) the external and middle ordinate distances for this curve (E and M), (4) the long chord (LC), and (5) the station of the PC and PT. (20 marks)

7. A +2.50% grade meets a -1.75% grade at station 44+25 and elevation 368.96 ft. An equal-tangent parabolic curve 800 ft long has been selected to join the two tangents. Determine the (1) the station and elevation of the beginning of vertical curve (BVC), (2) the station and elevation of the end of vertical curve (EVC), and (c) the station and elevation of the curve's high point. (20 marks)