

## National Exams May 2019

### 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. Approved Casio or Sharp calculator is permitted.
3. Nine (9) questions constitute a complete exam paper.
4. Each question is of varied value of Marks, as total of 100.
5. Most questions require an answer in essay format and calculation. Clarity and organization of the answer are important.

### 04-Geom-A1, Surveying

1. Briefly explain the procedure that requires to be taken at following instrument tests **(10 Marks)**.
  - a) Zero Test error of EDM **(3 Marks)**.
  - b) Collimation Error in Total Station **(4 Marks)**.
  - c) Two peg test **(3 Marks)**.
  
2. In a tunneling survey, it is required of the vertical control network that the maximum relative vertical positional errors between any survey points along the tunnel be within a tolerance of  $\pm 5$  mm. Interpret this tolerance and calculate the expected standard deviation of any survey point in the network, clearly stating your assumptions. Suggest the appropriate Canadian vertical control levelling order for this project, assuming the longest distance between any two points is 2.8 km. **(10 marks)**
  
3. The vertical angle from point A to B is  $+3^{\circ}27'30''$  and the slope distance is 17728.947m as measured by a total station, if the elevation of point A is 1000.55m above the ellipsoid, calculate horizontal distance from A to B **(10Marks)**.
  
4. Complete the differential level note that follow, put entire set of notes in proper field note form and marking all customary checks, calculate misclosure and distribute error using compass rule **(20 Marks)**.

Station	B.S	F.S.	$\Delta H$ (m)	Adjusted $\Delta H$ (m)	Height (m)
B.M.1	3.150				225.412
TP1	2.831	3.346			
TP2	4.104	2.725			
TP3	2.654	3.008			
B.M.2	0.368	3.208			
TP4	0.089	1.534			
TP5	2.863	3.736			
B.M.3	3.356	0.100			
TP6	2.781	1.662			
TP7	3.365	0.111			
B.M.1		6.059			
		Misclosure			

5. Given the following notes from a closed-loop traverse, the coordinate of  $X_A=1,984,400.612\text{m}$  and  $Y_A=518,430.033\text{m}$  in Cartesian XY-system, compute The error of misclosure **(10 Marks)**

Course	Azimuth	Distance, m
AB	$0^\circ 42'$	372.242
BC	$94^\circ 03'$	164.988
CD	$183^\circ 04'$	242.458
DA	$232^\circ 51'$	197.165

6. Station C is located by intersection from triangulation points B and A for which the coordinates are  $X_A=433,191.050\text{m}$ ;  $Y_A=158,893.500\text{m}$ . The distance and azimuth from the north of the line from A to B are  $895.425\text{m}$  and  $235^\circ 20' 32''$ , respectively. The measured horizontal angles  $BAC=80^\circ 27' 35.8''$  and angle  $CBA=54^\circ 14' 37.8''$ . Compute the coordinate of C by intersection. **(10 Marks)**
7. Control point BM.1 has geographic coordinate of  $\phi=43^\circ 10' 30.205''\text{N}$  and  $\lambda=121^\circ 30' 45.638''\text{W}$ . Determine UTM zone in which this point falls. **(10 Marks)**
8. Describe what constitutes a route cross section and how it is related to the profile of the route. **(10 Marks)**
9. Using a sketch, briefly describe the procedure of transferring the horizontal alignment from the ground surface to the underground **(10 Marks)**.