

KATHMANDU UNIVERSITY  
End Semester Examination  
March/April 2017

APR 18 2017

Level : B.E.  
Year : II  
Time : 2 hr 30 mins.

Course : GEOM 202  
Semester: I  
F.M. : 40

SECTION "B"  
[6Q. × 4 = 24 marks]

Attempt ANY SIX questions. Assume suitable data if necessary.

1. Define reciprocal levelling. Reciprocal levelling was conducted across a wide river to determine the difference in level of points A and B. Point A is situated on one bank of the river and B is situated on the other side of the river. The following results on the staff held vertically at A and B from level stations 1 and 2, respectively, were obtained. The level station 1 was near to A and station 2 was near to B.

Instrument at	Staff reading on	
	A(m)	B(m)
1	1.485	1.725
2	1.190	1.415

- a. If the reduced level of B is 55.18 m above the datum, what is the reduced level of A?
- b. Assuming that the atmospheric conditions remain unchanged during the two sets of the observations, calculate:
- (i) the combined curvature and refraction correction if the distance AB is 315 m, and
- (ii) the collimation error [1+3]
2. Mention advantages and disadvantages of theodolite resection over theodolite intersection. Find the coordinates of the intersection of the two rays RX and SX. The details of which are given in the table below. [2+2]

	Easting (m)	Northing (m)	Bearing
R	45328.172	26985.030	RX = 234°48'20"
S	44626.185	26916.600	SX = 126°11'30"

3. Briefly explain how EDM computes the distance from the phase differences.
- a. If an EDM with a wavelength of 60 feet measures a distance resulting in double path length of 50.25 cycles, what is the length of the line measured?
- b. If an EDM has a standard error of  $\pm (0.007\text{ft} + 2\text{ppm})$ , what would be the expected error in measuring a 3000 feet line? [2+1+1]

4. Define principle of traversing with suitable diagram. What are the factors to be considered while selecting traverse station? Briefly explain how checks on open traverse could be applied. [1+1+2]
5. Derive an expression showing the process of reducing the horizontal angles in case of satellite station. The directions observed from a satellite station S, 62.18 m from a triangulation station C, to the triangulation stations A, B, and C are  $0^{\circ}00'00''$ ,  $71^{\circ}54'32''$  and  $296^{\circ}12'02''$  respectively. The lengths of AC and BC are 8240.6m and 10863.6m, respectively. Deduce the angle ACB. [2+2]
6. Compare the two different methods of control survey: the triangulation and trilateration. Mention the steps of approximate method of adjustment of a braced quadrilateral in trilateration with appropriate figure. [2+2]
7. What is the purpose of making well-conditioned triangle in triangulation? Derive an expression to show the best shape of triangular arrangement in triangulation network? [1+3]
8. Define Magnetic Declination. Establish the relationship between magnetic bearing, true bearing and magnetic declination. A man on the deck of a ship observes a luminous object, which is 50 m above sea level. If the man's eye sea level is 10 m above sea level, find the distance between the man and the object. [1+1+2]

SECTION "C"

[2Q.  $\times$  8 = 16 marks]

Attempt ANY TWO questions. Assume suitable data if necessary.

- 9.a. Prepare specification for control point establishment in KU premises using theodolite for the purpose of topographical surveying. [4]
- b. What is the relationship between spherical excess and area of triangle in primary triangulation? In a geodetic survey, the mean angles of a triangle ABC having equal weights, are as below:
 

$\angle A = 62^{\circ}24'18.4''$   
 $\angle B = 64^{\circ}56'09.9''$   
 $\angle C = 52^{\circ}39'34.4''$

Side AB has length of 34606.394 m. Estimate area of plane triangle, spherical excess and finally the corrected values of three angles. Take the radius of the earth to be 6383.393km. [1+3]

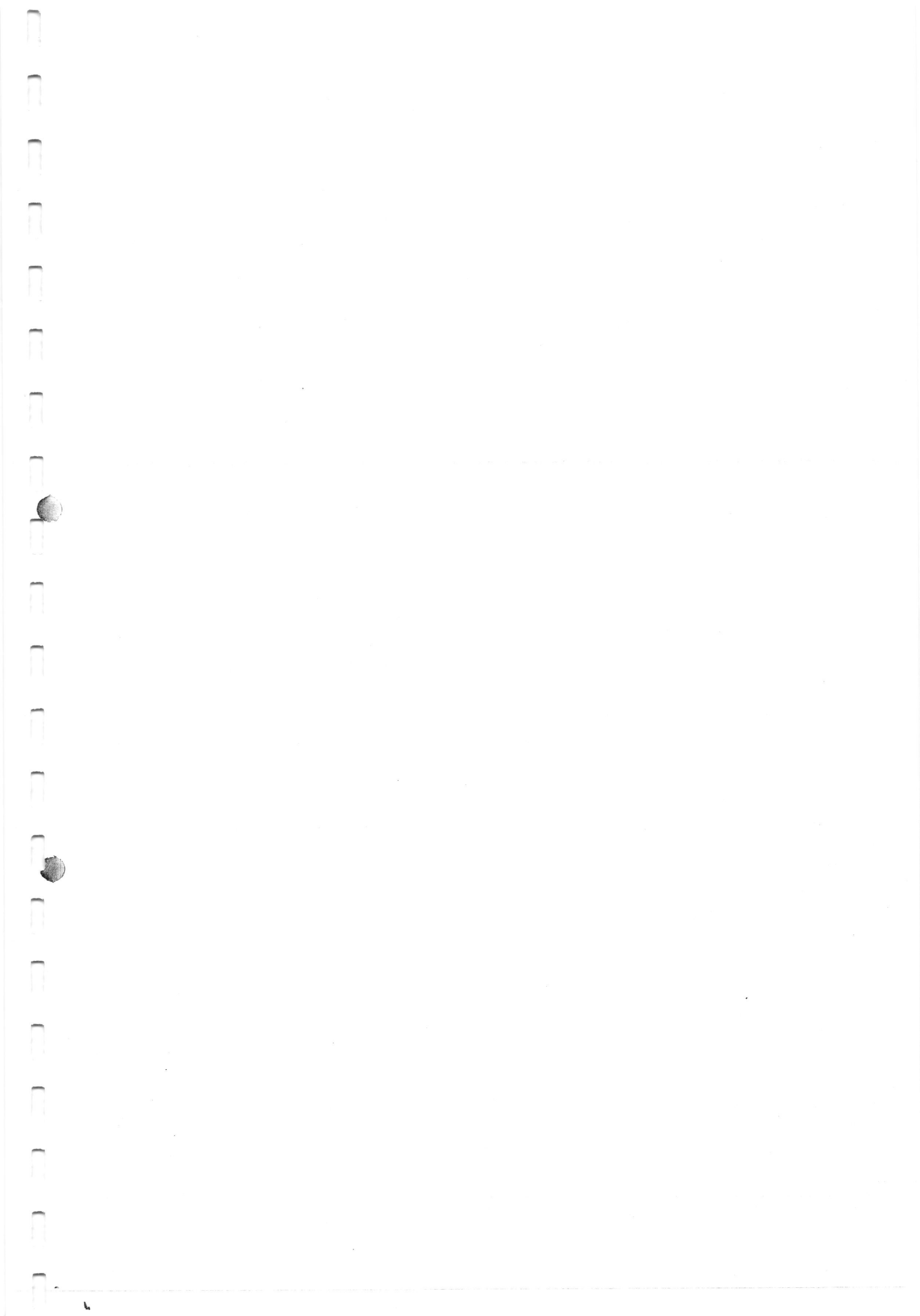
10.a. Define collimation error. Derive an expression to show that error due to inclined line of collimation is eliminated if backsight and foresight distances are kept equal. You are free to choose any of the two cases: either line of collimation inclined upwards or inclined downwards. [1+3]

b. The following readings were taken with a level and a 4m staff. Draw up a level book page and reduce the levels by the Height of instrument method. The backsights are being underlined and C.P represents change point. The first reading was taken on a benchmark 1458.250m. [4]

0.578, 0.933, 1.768, 2.450, (2.005 and 0.567) C.P., 1.888, 1.181, (3.679 and 0.612) C.P., 0.705, 1.810.

11. The following table represents the angle observation of a closed traverse ABCDEA. Deduce the included angle of each station, adjust the error in angles if any and finally compute the bearing of traverse legs. If theodolite is used to observe these angles having least count of 1cg, what is the angular misclosure for the given traverse? The bearing of the initial line 1001-1005 is  $75^{\circ}30'00''$ . You do not need to copy the table in your answer sheet. [8]

Station		Face	Horizontal readings														
From	To		Set I			Mean		Set II			Mean		Set III			Mean	
		g	c	cc	C	cc	g	c	cc	c	cc	g	C	cc	c	cc	
1001	1005	L	000	10	00			067	20	00			133	30	00		
		R	200	10	25			267	19	75			333	30	50		
	1002	L	092	02	75			159	12	75			225	23	00		
		R	292	02	25			359	13	00			025	22	50		
1002	1001	L	000	10	00			067	20	00			133	30	00		
		R	200	09	75			267	20	00			333	30	25		
	1003	L	100	10	50			167	20	00			233	31	00		
		R	300	10	25			367	20	75			033	29	75		
1003	1002	L	000	10	00			067	20	00			133	30	00		
		R	200	09	50			267	19	75			333	30	50		
	1004	L	138	05	75			205	16	50			271	26	25		
		R	338	06	00			005	16	00			071	25	25		
1004	1003	L	000	10	00			067	20	00			133	30	00		
		R	200	11	00			267	19	50			333	30	25		
	1005	L	166	08	75			233	18	50			299	29	25		
		R	366	09	00			033	18	25			099	28	25		
1005	1004	L	000	10	00			067	20	00			133	30	00		
		R	200	09	25			267	20	50			333	30	25		
	1001	L	104	23	00			171	33	50			237	42	00		
		R	304	22	25			371	32	75			037	43	25		



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Marks Scored:

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Exam Roll No.:

Time : 30 mins.

Course : GEOM 202

Semester : I

F.M : 10

Date :

APR 6 2017

Registration No:

SECTION "A"

[20 Q.×0.5=10 marks]

Choose the best alternatives among the given choices:

- If sensitivity of a bubble tube is 30" per 2mm division what would be the error in staff reading on a vertically held staff at a distance of 200m when the bubble is out of center by 2.5 divisions?
  - Error do not occurs
  - 0.073m
  - 0.73m
  - 0.0073m
- 205 - 112/2 represents \_\_\_\_\_.
  - First order PBM
  - Second order PBM
  - Second order TBM
  - First order TBM
- The sum of exterior angles for a seven sided closed traverse is \_\_\_\_\_.
  - 1620°
  - 900°
  - 1600°
  - 1420°
- Reciprocal leveling is employed to determine the accurate difference in level of two points which \_\_\_\_\_.
  - are at almost same elevation
  - are quite close and where it's not possible to set instrument midway between points
  - have very large difference in level and two instrument settings are required to determine the difference in level.
  - are quite apart and where it's not possible to set instrument midway between points
- If horizontal distance is 'D', slope distance is 'l', vertical angle is 'θ' and zenithal angle is 'Z', the formula to calculate elevation (h) in theodolite traverse is \_\_\_\_\_.
  - $h = D \tan \theta$
  - $h = l \sin \theta$
  - $h = D \cot Z$
  - Either 'a', 'b' or 'c'
- While measuring zenithal angles by  $T_2$  and  $T_{16}$  theodolites, if the closing error is not exactly 400 grade, the difference is known as :
  - The collimation error
  - The index error
  - The Zenithal error
  - The Swing error
- For measuring a horizontal angle between two lines with better accuracy than that given by the vernier, the method commonly used is called \_\_\_\_\_.
  - Double sighting
  - Reiteration
  - Repetition
  - Double centering



16. Modern EDM instruments work on the principle of measuring \_\_\_\_\_.
- the reflected energy generated by electromagnetic waves
  - total time taken by electromagnetic wave in travelling the distance
  - the change in frequency of the electromagnetic waves
  - the phase difference between transmitted and reflected electromagnetic waves
17. Pick out the INCORRECT statement about the characteristics of a good signal.
- General rule for height 'h' of signal is  $h = 13.3D$ , D being distance in km.
  - The shape should be such that the phase error is minimum.
  - General rule for diameter of signal is  $d \text{ (cm)} = 2.3D \text{ to } 2.9D$ .
  - It should be conspicuous i.e. clearly visible.
18. In trilateration angles, \_\_\_\_\_ are measured.
- all three angles of the triangle
  - all the angles and one side of the triangle
  - two angles and one included angle of the triangle
  - all three sides of the triangle
19. What is CORS network?
- Common Observation Reference Station
  - Coordinate Recording System Network
  - Continuously Operating Reference Station Network
  - Continuously Operating Radar Satellite Network
20. The value of  $\frac{D-C}{D}$  for the triangulation figure shown below is \_\_\_\_\_ where the broken lines indicate that the observation has been taken in only one direction.
- 0.6
  - 0.64
  - 0.67
  - 0.62

