KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B.E. | Course : GEOM 202
Year : II | Semester: I
Exam Roll No.: | Time: 30 mins. | F.M. : 10
Registration No.: | Date : MAR 16 2018

SECTION "A"
[20 Q.× 0.5 = 10 marks]

Choose the most appropriate alternatives among the given choices:

1. If N is the number of stations, the least count of the instrument is 20″, then the limit on the angular error of closure in traversing should not be
   a. $< 20\ N$
   b. $> 20\ N$
   c. $< 20\sqrt{N}$
   d. $> 20\sqrt{N}$

2. How many times should an observer at the theodolite station show the heliotrope to the observer at the heliotrope station for signifying "observation finished today"?
   a. 5 dashes, 5 dots
   b. A dash, a dot
   c. 10 dots
   d. Depends on observer

3. Observations were made on the center of a 3m diameter signal, from the instrument at A. The distance AB is 5.635km and the sun makes an angle of 42^0 with the line AB. The phase error AB if the observations are made on the bright line is:
   a. 51.26″
   b. 89.55″
   c. 5.126″
   d. 8.955″

4. Which among the following is a wrong statement?
   a. Zero error of levelling staves can be eliminated by making fore and back sights equal.
   b. Effect of collimation error can be minimized by reading on face left and face right positions of theodolite
   c. Horizontal axis is always perpendicular to plumb line at the point
   d. Error due to refraction increases with distance of the object of being sighted.

5. What should be the sum of interior angles for a closed-polygon traverse that has 7 sides?
   a. 900^0
   b. 720^0
   c. 1440^0
   d. 540^0

6. The intersection of the horizontal axis, the vertical axis and the line of collimation in theodolite is known as:
   a. Optical center
   b. Instrumental center
   c. Mechanical center
   d. Phase center

7. Which of the following is False, regarding lines available in theodolite?
   a. The vertical axis is parallel to the plane containing the horizontal circle.
   b. The line of sight is parallel to the axis of telescope bubble tube.
   c. The axes of the plate levels lie in a plane parallel to the horizontal circle.
   d. The horizontal axis is normal to the vertical axis.

8. The difference between face left and face right of an object is double the value of _____
   a. Index error
   b. Collimation error
   c. Zero error
   d. Centric error

9. How far will a horizontal line depart from the Earth's surface in 10 km?
   a. 94.80m
   b. 67.50m
   c. 6.750m
   d. 9.480m

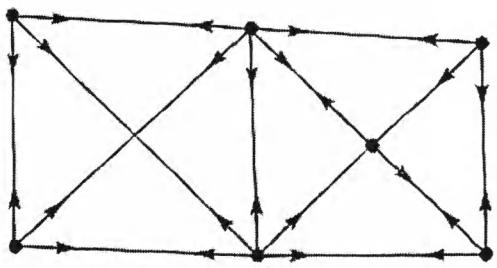
10. When a level is in adjustment, the line of sight of the instrument is
   a. Perpendicular to the vertical axis of the instrument and bubble level axis
   b. Perpendicular to the bubble tube axis and parallel to the vertical axis
   c. Perpendicular to trunnion axis and parallel to horizontal axis
   d. Perpendicular to vertical axis of instrument and parallel to the bubble tube axis

11. The value of $\frac{D-C}{D}$ for the triangulation figure where the directions observed are shown by the arrows is:
   a. 0.68 b. 0.78 c. 0.67 d. 0.64

12. The whole circle bearing of the line whose quadrantal bearing is S19°30'E is
   a. 340°30'
   b. 199°30'
   c. 19°30'
   d. 160°30'

13. A level setup midway between X and Y reads 6.29m on X and 7.91m on Y. When moved within a few meter of X, readings of 5.18m on X and 6.76m on Yare recorded. What is then reading required on Y to adjust the instrument?
   a. 0.04m
   b. 0.02
   c. 1.62m
   d. 6.80m

14. The results of reciprocal leveling between stations A and B 250m apart on opposite sides of a wide river were as follows. The true difference of level between the station is:



Level at t of eyepiece (m)	*eading (m)*
A	on B
B	on A

   a. -0.964m
   b. 0.964m
   c. 0.156m
   d. -0.156m

15. Strength of fix is maximum when the point to be located P lies at the _____ of the great triangle ABC.
   a. Incenter
   b. Centroid
   c. Orthocenter
   d. Mid-point

16. Electromagnetic waves used in EDM are unaffected by
    a. Air temperature
    b. Atmospheric pressure
    c. Vapour pressure
    d. Wind speed

17. The position of signals in triangulation survey is always checked for
    a. Dismantling erected signals
    b. Whether signal is centric or not
    c. Whether station is centric or not
    d. Whether the signal and station both are centric or not.

18. 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
    a. The collimation error
    b. The Zenithal error
    c. The index error
    d. The vertical error

19. The spherical excess for a triangle of area 200 km^2 **(Assume Radius of earth = 6400km)** is approximately
    a. $0.5''$
    b. $1.007''$
    c. $1.5''$
    d. $2.0''$

20. A third point C cannot be located using two points A and B of known locations by measuring
    a. All the sides of triangle ABC
    b. Two angles A and B and the length AB
    c. All the angles of triangle ABC
    d. The angle A, and the lengths AB and BC

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F.M. : 40

SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt any *SIX* questions. Assume suitable data where necessary.

1. Define sensitivity of a level tube. Show that the sensitivity of level tube depends on the radius of curvature (R) and is usually expressed as angle (θ) per unit division (d) of the bubble scale. Mention how the sensitivity of a bubble tube can be increased. [1+2+1]

2. Define control survey. Mention the different order of classification of control points as per the Survey Department of Nepal with its number. What are the applications of control survey? [1+1+2]

3. Define Ground Swing in EDM. If an EDM instrument has a purported accuracy capability of ± (5mm+5ppm), what error can be expected in a measured distance of 3km? Explain briefly on how EDM computes the distance from the phase differences? [1+1+2]

4. State the various methods of balancing a closed traverse. State under what circumstances each one is preferred. Explain why transit rule is more suitable than Bowditch rule for adjustment of a closed theodolite traverse. [1+1.5+1.5]

5. Mention the different condition of adjustment of braced quadrilateral and illustrate with diagram. Derive an expression for corrections value (v") to satisfy the side conditions.[2+2]

6. Deduce the relationship between line of sight and line of collimation, line of sight and axis of telescope, line of collimation and horizontal axis. Briefly explain the temporary adjustments of a theodolite. [1.5+2.5]

7. Define geodetic triangle. In a geodetic survey, the mean angles of a triangle ABC having equal weights, are as below:
∠A=62°24′18.4″, ∠B=64°56′09.9″ and ∠C=52°39′34.4″.
Side AB has length of 34606.394 m. Estimate the corrected values of the three angles. ***Take the radius of the earth to be 6383.393 km.*** [1+3]

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt any *TWO* questions. Assume suitable data where necessary.

8. A) Mention the steps of approximate method of adjustment of a braced quadrilateral in trilateration with appropriate figure of each step along with associated corrections.
B) A Tienstra resection method was used to fix point P from three points A, B, and C, whose coordinates are listed below in a table. ***Note that the observed directions are not the bearings.*** Find the coordinates of P. [4+4]

Station	*Easting (m)*	*Northing (m)*	*Observed directions*
A	3613.52	8609.71	PA = 000°00′00″
B	7444.39	3487.16	PB = 112°34′50″
C	1712.06	1693.38	PC = 245°43′21″

9. A) Nepal Electric Authority (NEA) is seeking Surveyor for a 900MW hydropower. Your responsibility would be to establish control points at the bank of Karnali River for upstream downstream survey (35km length) from temporary location of dam site. Briefly explain the field procedure in order to establish horizontal and vertical control points.
B) Balance the following interior angles (angles-to-the-right) of a five-sided closed polygon traverse. If the azimuth of side AB is fixed at 74°31′17″, calculate the azimuths of the remaining sides. A = 105°13′14″; B = 92°36′06″; C = 67°15′22″; D = 217°24′30″; E = 57°30′38″. (***Note line BC bears NW.***) [4+4]

10. A) Why is it important for a benchmark to be a stable, relatively permanent object? The orthometric height of a particular benchmark is 87.95m. The Geoidal height at the station is -30.66m. Is the station above or below the ellipsoid? Draw a sketch depicting the geoid, ellipsoid, and benchmark.
Work out the true difference in level (***Find R.L. of point B***) between two points A and B if curvature and refraction effects are taken into account in the following case:

Level set over point A, Staff held over point B
R.L. of point A = 100.000m
Height of instrument at point A = 1.000m
Reading at staff on point B = 2.000m
Distance AB = 300m
Assume Diameter of Earth = 12,742km

B) The following readings (***in meter***) were taken with a level and 4 m staff. Draw up a level book page and reduce the levels by the height of instrument method.

0.578 B.M. (= 58.250 m), 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. ***Apply arithmetic check as well.*** [4+4]