KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.E.
Year : III

Course : GEOM 307
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : June-02, 022

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate option.

1. Which one of the following is **NOT** random in levelling?
   a. Instrument levelling
   b. Instrument centring
   c. distance observation
   d. reading graduated scales

2. Probability curve describes about
   a. Normal Equation
   b. Frequency of Error
   c. Probability Equation
   d. Normal Probability Density

3. Determine the Most Probable Error in a single measurement if the summation of the difference between mean and single observation is given as 8.76 in a series of 7 observations.
   a. 0.98 b. 0.93 c. 9.08 d. 0.89

4. Which of the following statement is **INCORRECT**?
   a. The reduce level of a point is an independent quantity
   b. An independent quantity does not have any relation with other quantities
   c. The change in other quantities do affect the value of the independent quantity
   d. The value of the observed quantity depends upon the value of other quantities is called independent quantity

5. If the standard error in length of a square 1 m × 1 m is ±0.1 cm, the standard error of area will be.
   a. ±10 cm^2 b. ±12.34 cm^2 c. ±14.14 cm^2 d. ±13.24 cm^2

6. The Station Adjustment of observation means
   a. Making sum of the angles observed around a station equal to 360°.
   b. Checking the permanent adjustment of the instrument at every station.
   c. Adjusting the instrument so that it is exactly over the station.
   d. Shifting the station location to make it indivisible from other stations.

7. If the observations of a quantity contains systematic and random errors, the most probable value of the quantity is obtained by
   a. Removing the systematic and random error from the observations
   b. Removing the systematic errors and minimizing the residuals from the observations
   c. Removing the random errors and minimizing the systematic error from the observations
   d. Minimizing the systematic and random errors from the observations

8. Correlate is the unknown multiplier used to determine the most probable values by multiplying it with
   a. Normal equation
   b. Observation equation
   c. Condition equation
   d. Condition imposed by the least squares theory

9. The spherical excess for a triangle of area 200 sq. km is approximately
   a. 0.5″ b. 1.0″ c. 1.5″ d. 2.0″

10. Which of the following method is known as a rigid method of figure adjustment?
   a. Method of differences b. Method of correlates
   c. Method of least squares d. Direct method

11. If the three angle of a triangle each have a standard error of $\pm 4''$, what is the total error in the triangle?
   a. $\pm 6.09''$ b. $\pm 7.46''$ c. $\pm 7''$ d. $\pm 6.93''$

12. The angle A and B are related as A = 5B, if the observed value of the angle B is $20°10'30''$ with standard error of $\pm 0.05''$, what is the standard error of A?
   a. $\pm 0.05''$ b. $\pm 0.01''$ c. $\pm 1.25''$ d. $\pm 0.25''$

13. If the scaling factor values sx and sy < 1 then,
   a. It increases the size of object. b. It stunts the shape of an object.
   c. It reduces the size of object d. It does not change the shape of object.

14. Which of the following represents the correct set of constants and variables present in a normal equations?
   a. 4 consonants, 3 variables b. 3 consonants, 4 variables
   c. 2 consonants, 2 variables d. 1 consonants, 1 variables

15. The line which passes through the focus and perpendicular to the major axis is
   a. Minor axis b. Latus rectum c. Directrix d. Tangent

16. Consider a hypothesis H_0 where $\varphi_0 = 5$ against H_1 where $\varphi_1 > 5$. The test is
   a. Right tailed b. Left tailed c. Centre tailed d. Cross tailed

17. Log sine correction is made in triangulation to satisfy.
   a. Apex correction b. Opposite correction c. side correction d. peripheral sum

18. Goodness of fit of a distribution is tested by
   a. t-test b. F- test c. Chi-square test d. z- test

19. Which of the following properties are preserved in affine transformations?
   a. co-linearity b. convexity c. concavity d. parallelism

20. Which transformation is used, to change the size of an object?
   a. Scaling transformation b. Vector transformation
   c. Simple transformation d. Reflection transformation

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F.M. : 40

SECTION "B"
[6 Q. × 4 = 24 marks]

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

1. What do you understand by adjustment of observation? "Measurement is not a single act". Explain the statement with example.

2. What is a normal distribution curve? Write down the characteristic of Normal distribution curve and how would you obtain it?

3. a. What are the rules used for the adjustment of level lines in which levels are taken under similar conditions?

   b. Determine the volume of the box whose sides are as follows:
   $l = 20 \pm 0.02$ cm
   $b = 12 \pm 0.01$ cm
   $d = 10 \pm 0.01$ cm

4. Describe various types of error in testing of hypothesis. Explain with flowchart the steps of finding p-value.

5. Discuss the procedure for
   a. Figure adjustment of a plane triangle
   b. Figure adjustment of a geodetic triangles
   c. Computation of sides of geodetic triangles

6. a. What do you mean by blunder detection? What are the types of blunder detection? Describe the data snooping and tau test.

   b. Why does surveying adjustment needed computer optimization? How does Normal equation help to storage optimization? Explain briefly.

7. a. Explain the procedure of observation equation method for determining Most Probable Value (MPV).

   b. Find the most probable value of the angle A, B, and C of a triangle ABC from the following observations using method of differences

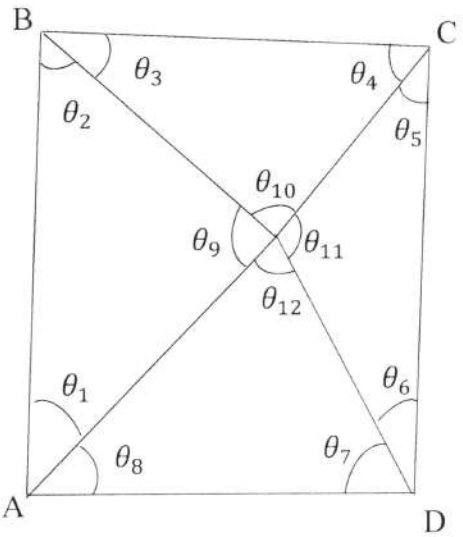
$A = 77°14'20"$	$Wt. = 4$
$B = 49°40'35$	$Wt. = 3$
$C = 53°04'52"$	$Wt. = 2$

SECTION "C"
[2 Q × 8= 16 marks]

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

8. Figure shows a quadrilateral ABCD with a central station O. The angles measured are as below: -

$\theta_1 = 29°17'00"$ $\theta_2 = 28°42'00"$
$\theta_3 = 62°59'49"$ $\theta_4 = 56°28'01"$
$\theta_5 = 29°32'06"$ $\theta_6 = 32°03'54"$
$\theta_7 = 59°56'06"$ $\theta_8 = 61°00'54"$
$\theta_9 = 122°00'55"$ $\theta_{10} = 60°32'05"$
$\theta_{11} = 118°23'50"$ $\theta_{12} = 59°03'10"$

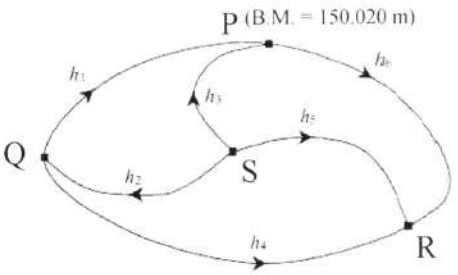


Determine the most probable values of the angles assuming that the angles have same reliability and have been adjusted for station adjustment and spherical excess.

9. a. How do you adjust a level-line circuit?

b. The observed difference in level for the points in a level nets showing in figure are given below.

From (Lower point)	From (Lower point)	Level difference (m)
Q	P	$h_1 = 6.226$
S	Q	$h_2 = 5.133$
S	P	$h_3 = 11.368$
Q	R	$h_4 = 23.521$
S	R	$h_5 = 28.639$
P	R	$h_6 = 17.275$



Determine the most probable values of the elevations of Q, R and S if the observations are uncorrelated and of equal reliability.

10. a. Find the most probable values of the angles A, B, and C from the following observations at a station.

$A = 30°12'26.5"$ $Wt. = 1$
$B = 32°45'38.2"$ $Wt. = 2$
$A + B = 70°57'38.6"$ $Wt. = 2$
$A + B + C = 126°28'0.6"$ $Wt. = 3$
$B + C = 88°15'37.8"$ $Wt. = 1$

b. A surveyor carried out levelling operations of a closed circuit ABCDA, starting from A and found that

B was 8.71m	above A,
C was 5.59 m	above B,
D was 2.17m	above C,
D was 14.76 m	above A

The accuracy of the four levelling operations is assumed to be equal. Determine the probable heights of the B, C, and D above A by the method of correlates (No other method will be allowed)