Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2023

B.E. GEOINFORMATICS
5th Semester
GI5501 Spatial Data Adjustment
(Regulation 2019)

Time: 3hrs | Max. Marks: 100

CO 1	Imparts concepts of error, error distribution and error adjustment procedures.
CO 2	Understand the procedure involved in error adjustment using least square adjustment.
CO 3	Convey an idea about the quality of infinite size data by Variance and Covariance.
CO 4	Choose the suitable accuracy of instruments for their projects by pre analysis.
CO 5	Create database by collecting quality data sets.

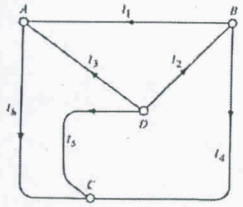
BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

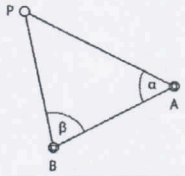
PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	What is the range of uncertainty for a normally distributed measurement with a mean of 100.156m and a standard deviation of 0.012m at confidence levels of 99.7% and 95.4%?	2	1	1
2	List the significant advantages of the Least squares method.	2	1	1
3	Differentiate discrete and continuous random variables.	2	2	2
4	Describe the concept of weight in levelling.	2	2	2
5	What is the i) covariance of XY and ii) variance of X and Y coordinates of the survey point, given the correlation coefficient of XY is 0.32 cm and the standard deviation of X and Y is 1.31 cm and 1.09 cm, respectively?	2	3	1
6	Differentiate covariance and correlation.	2	3	2
7	What are the advantages of the vector data model?	2	4	1
8	Differentiate the three types of databases.	2	4	2
9	Differentiate ECEF and Cartesian coordinate system.	2	5	2
10	List out the various surveying methods used in point determination.	2	5	1

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	The length of the side of the square tract is measured with a 30m long steel tape and is observed to be 50.170m. If the tape is known to be too short by 0.030m, calculate and analyze the corresponding error in the calculated area by error propagation method with a neat sketch.	10	1	3
(ii)	Examine the different types of histograms with a neat sketch.	3	1	3
	OR			
11 (b) (i)	A straight line AC length was measured in two sections, AB and BC, using Total Station 1 (TS1) and Total Station 2 (TS2),	10	1	3

	respectively. Assuming that all measurements are free from gross and systematic errors, solve the following questions. a) Calculate the most probable value for the lengths of AB and BC to two decimal places, b) Calculate the standard deviation of the lengths of AB and BC to two decimal places, c) Determine which total station provides more precise measurements and justify, d) Calculate the total length of the line AC and its standard deviation in two decimal places. **No** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 **AB length (cm) by TS1** | 67.5 | 68.0 | 67.4 | 67.6 | 67.9 | 67.5 | 67.4 | 67.9 | 67.5 | 67.2 **BC (cm) by TS2** | 25.7 | 25.1 | 25.2 | 26.0 | 25.1 | 25.0 | 25.8 | 25.9 | 25.8 | 25.9			
(ii)	Examine the types of errors with a neat sketch.	**3**	1	3
12 (a) (i)	A distance is measured 4 times with the following results: $l1$= 32.51 m, $l2$= 32.48 m, $l3$= 32.52 m and $l4$= 32.53 m. Calculate the least squares estimate of the distance.	**10**	2	3
(ii)	Calculate the weights of the three uncorrelated observations: 136.225 m (σ = 0.010 m), 136.233 (σ = 0.032 m), and 136.218 m (σ = 0.024 m).	**3**	2	3
	OR			
12 (b) (i)	A is a benchmark with a known elevation of 281.130 m. The following differences in elevation are observed using a direct leveling procedure. Compute and analyze elevations of B, C, and D by applying least square method. From (lower) | To (higher) | Difference in Elevation (m) B | A | L1= 11.973 D | B | L2= 10.940 D | A | L3= 22.932 B | C | L4= 21.040 D | C | L5= 31.891 A | C | L6= 8.983 	**10**	2	3
(ii)	Examine the merits and demerits of the concept of weight method.	**3**	2	3
13 (a) (i)	The position and elevation of a survey station are given by the random vector $x=\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}$ in which X_1 and X_2 are planimetric coordinates and X_3 is the elevation. The standard deviations of X_1, X_2, and X_3 are 0.025, 0.050, and 0,015 m, respectively. The correlation coefficient X_1 and X_2 is -0.50. There is no correlation between X_1 and X_3 or between X_2 and X_3. Determine the covariance matrix of X if the variance of 0.000625 m^2 is chosen.	**13**	3	3
	OR			
13 (b) (i)	Examine the various types of sampling strategies with a neat sketch.	**13**	3	3
14 (a) (i)	The velocity of light is known to be 299792.5 km/sec with a standard deviation of 0.1 km/sec. If the index of refraction of the atmosphere can be determined with a relative accuracy σ_n/n of 2.0 ppm, the modulation frequency of a particular EDM instrument can be determined with a relative accuracy σ_f/f of 1.0 ppm, phase difference can be measured with a standard deviation of 5.0 mm, and the zero correction can be determined with a standard deviation of 2.5 mm, analyze the factors a and b and determine the standard deviation of a distance measurement of 2 km.	**7**	4	4
(ii)	A repeating theodolite is used to measure the angles of a traverse, the sides of which are essentially in a straight line. The length of each traverse side is approximately 800m. The standard deviations in instrument centering, target alignment, pointing and	**6**	4	4

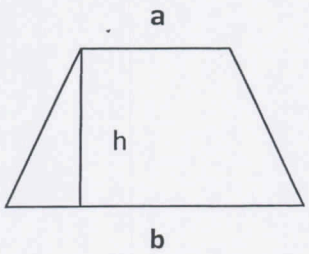
	circle reading are σ_c= 2.0 mm; σ_t= 4.0 mm; σ_p= 2.0" and σ_r= 6.0". Analyze the expected standard deviation in measuring each angle of the traverse if one set of observations is taken.			
	OR			
14 (b) (i)	Analyze the components of DBMS.	**7**	4	4
(ii)	The dimensions of the base of a large rectangular reservoir are 75 m and 55 m; If the area of the reservoir's base is to be determined with a standard deviation of 0.5 m^2, analyze the required standard deviations of the measurements of the reservoir's dimensions, assuming the measurements have balanced accuracies.	**6**	4	4
15 (a) (i)	Calculate the coordinates of the unknown point P from the known locations A and B whose coordinates are given below. The measured angles α and β are 81°34'45" and 66°45'57", the distance between AB is 826.907 m, and the whole circle bearings of AB and BA are 248°08'38" and 68°08'38" respectively. 	**13**	5	3

Point	E [m]	N [m]
A	658 077.70	247 431.38
B	657 310.23	247 123.54

	OR			
15 (b) (i)	Demonstrate the steps involved in the development of a similarity transformation equation.	**13**	5	3

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Calculate the area of the following land parcel and its standard error through the error propagation method and evaluate whether the measurements are within the tolerance limit (0.56). The land parcel is measured with the following results: a= 55.12 ± 0.05 m, b= 75.32 ± 0.03 m, and h = 50.55 ± 0.03. 	**15**	1	5