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

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2024

GEOINFORMATICS ENGINEERING BRANCH

Semester - IV

GI5405 & SURVEYING II

(Regulation 2019)

Time:3 hrs

Max. Marks: 100

CO1	Imparts concepts of Theodolite Surveying.
CO2	Understand the procedure for establishing horizontal and vertical control and its adjustment procedure.
CO3	Determination of Azimuth, Latitude, Longitude and Time by astronomical observations.
CO4	Do the setting out works for route surveying.
CO5	Initiate the knowledge in Hydrographic and Mine surveying.

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)

(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	Differentiate between a Vertical angle and a Zenith angle and write their relationship	**2**	1	L2
2	Write short notes on the steps involved in the temporary adjustment of a Vernier transit	**2**	1	L1
3	When should Triangulation and Trilateration surveys be used to establish horizontal control points?	**2**	2	L2
4	Differentiate between the concepts of true value and most probable value.	**2**	2	L2
5	Define the terms: Celestial Sphere and Celestial Horizon.	**2**	3	L1
6	Write short notes on the Nautical Almanac.	**2**	3	L1
7	How does route surveying differ from other types of surveying?	**2**	4	L2
8	List the uses of reverse curve.	**2**	4	L1
9	Define "chart datum" in the context of hydrographic surveying.	**2**	5	L1
10	What are the primary objectives of mine surveying?	**2**	5	L1

PART- B (5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q. No.	Questions	Marks	CO	BL
11 (a)	Given the following data to determine the elevation of a hill's top (Q): A flagstaff of 2 meters in height was erected at the hill's top (Q). Observations were made from two stations, P and R, which are 60 meters apart. The horizontal angle measured at P between R and the top of the flagstaff was 60° 30'.	**13**	1	L3

	The horizontal angle measured at R between the top of the flagstaff and P was 68° 18'. The angle of elevation to the top of the flagstaff was measured to be 10° 12' at P. The angle of elevation to the top of the flagstaff was measured to be 10° 46' at R. Staff readings on B.M. (Benchmark) when the instrument was at P = 1.965 meters. Staff readings on B.M. when the instrument was at R = 2.055 meters. The elevation of the B.M. was 435.065 meters. • Apply the principles of trigonometry to determine the horizontal distances from P and R to the top of the flagstaff (Q). Use the given angles and distances in your calculations. • Calculate the elevation of the top of the flagstaff (Q) by combining the measured angles of elevation and staff readings. Explain each step of your calculations clearly. • Determine the final elevation of the top of the hill by considering the height of the flagstaff and the elevation of the B.M. Provide a detailed solution and the final elevation value.			
	OR			
11 (b)	To determine the gradient between two points P and Q, a tacheometer fitted with an analectic lens was set up at station R. The following observations were taken with the staff held vertically: The horizontal angle PRO is 75º 25' 42". The multiplying constant of the tacheometer is 100. The reduced level (RL) of station R is 125.525 meters. The height of the instrument (HI) at R is 1.623 meters. • Compute the horizontal distances to points P and Q using the tacheometric formula, considering the observed horizontal angle and the multiplying constant. • Determine the reduced levels (RLs) of points P and Q by applying the necessary trigonometric calculations, considering the height of the instrument and any staff readings that would have been observed. • Calculate the gradient between points P and Q using the difference in their reduced levels and the horizontal distance between them.	**13**	1	L3
12 (a)	A closed traverse was conducted around an obstacle, and the following observations were made: • Analyze the given azimuths and lengths to establish the coordinate system for the traverse. Calculate the changes in coordinates (ΔX, ΔY) for each known side using trigonometric relationships.	**13**	2	L4

Staff Station	Vertical Angle	Staff Reading (m)
P	+4º 55' 48	1.210, 1.510, 1.810
Q	-1º 26' 39"	2.000, 2.310, 2.620

Side	Length (m)	Azimuth
AB	500	98° 30'
BC	620	30° 20'
CD	468	298° 30'
DE	?	230° 00'
EA	?	150° 10'

	• Calculate the missing lengths DE and EA by setting up and solving the equations derived from the closure condition. Use the known azimuths and the computed coordinates of points D and E. • Explain each step of your analysis and calculations, detailing the methods and principles used to determine the missing lengths.			
	OR			
12 (b)	In a triangulation survey, the following round of angles was observed from the central station to the surrounding stations: A = 93º 43' 22" (weight = 3.05) B = 74º 32' 39" (weight = 2.46) C = 101º 13' 44" (weight = 1.65) D = 90º 29' 50" (weight = 1.00) • Analyze the observed angles to identify any discrepancies or outliers that may affect the accuracy of the survey. • Assess the reliability of each angle measurement based on its associated weight. Consider the impact of weights on the adjustment process. • Apply the method of least squares adjustment to compute the adjusted angles. Explain the mathematical principles behind the adjustment process and how the weights are incorporated.	**13**	2	L4
13 (a)	i. Given the following observations made on the sun at a place with a latitude of 28º 32' 20" N and longitude of 75º 14' 42" E at 4:30 P.M.: Clockwise angle between the object R and the sun = 165º 18' 20" Declination of the sun at 4:30 P.M = 1º 2' 3" N Corrected altitude of the sun = 38º 12' 42" Perform the following tasks: • Apply the concepts of celestial navigation and spherical trigonometry to determine the sun's azimuth at 4:30 P.M. Describe the steps and formulas used in your calculations. • Determine the azimuth of the line CR, where C is the instrument station, using the given observations and the calculated azimuth of the sun. Provide a detailed explanation of the process and the resulting azimuth angle.	**8**	3	L3
	ii. Discuss the concept of the Astronomical Triangle	**5**	3	L2
	OR			
13 (b)	i. Apply the concepts of practical astronomy to determine the azimuth and altitude of a star from the following data: The declination of the star is 20º 25' 30" N The hour angle of the star is 72º 06' 15" The latitude of the observer is 13º 00' 40" N	**8**	2	L3
	ii. List the different coordinate systems employed in astronomical surveying. Explain any two in detail.	**5**	3	L2
14 (a)	Assess the geomatics techniques employed during the different stages of a new expressway road project, including reconnaissance, preliminary, and location surveys. Discuss the advantages over convention techniques.	**13**	4	L4
	OR			
14 (b)	Analyze the elements of the compound curve in surveying and derive its relationship with neat sketches.	**13**	4	L4

15 (a)	Discuss the latest techniques in hydrographic surveying to the preparation of bathymetric maps. Provide specific examples to illustrate the practical use of these techniques.	**13**	5	L3
	OR			
15 (b)	Discuss the principles in setting out tunnel alignment, considering their significance and effectiveness in ensuring accurate alignment with neat sketches illustrating key points.	**13**	5	L3

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16.	Given the following measurements taken with a digital theodolite at station O, where the angles were observed in a clockwise direction for points A, B, C, and D, perform the following tasks: • Assess the provided measurements of the angles AOB, BOC, and COD. Identify any potential sources of error and discuss how these might affect the overall accuracy of the measurements. • Adjust the included angles AOB, BOC, and COD using an appropriate method to ensure consistency and correctness. Describe the adjustment process in detail and explain why it is necessary. • Evaluate the accuracy and precision of the adjusted included angles. Use statistical methods to assess the reliability of the measurements and discuss the implications of your findings for practical applications.	**15**	1, 2	5

AOB			BOC			COD		
o	'	"	o	'	"	o	'	"
30	42	54.5	75	25	35.0	64	34	25.5
30	42	56.0	75	25	37.5	64	34	24.0
30	42	55.5	75	25	32.0	64	34	27.0
30	43	0.0	75	25	36.5	64	34	27.5
30	42	57.0	75	25	37.0	64	34	23.0
30	42	58.5	75	25	38.0	64	34	24.5

AOC			BOD		
o	'	"	o	'	"
106	8	33.5	139	59	59.0
106	8	35.5	140	0	1.0
106	8	34.0	140	0	2.5
106	8	36.0	140	0	2.0
106	8	32.5	139	59	58.5
106	8	33.0	139	59	59.5