

**Criteria Question (This question must be solved correctly in order to pass the test)**

Compute the horizontal and vertical readings, the effect of collimation and index error from the FL and FR readings!

Stat.	Targ.	Readings										
			Horizontal					Vertical				
			°	'	''	'	''	°	'	''	'	''
A	P	FL	316	00	05			85	22	08		
			315	59	57					14		
		FR	135	59	42			274	37	34		
					46					33		

**List of questions**

**Leveling**

1. List various approaches to determine the height of a point. (2)
2. The principle of leveling (figure, formula) (5)
3. The structure of the tilting level (figure, labels) (5)
4. List the systematic instrumental error sources of leveling, and the ways of their elimination (4)
5. List the systematic error sources induced by the leveling staff and their ways of elimination (2)
6. List the systematic error sources caused by external conditions in leveling, and their ways of elimination. (2)
7. List all the systematic error sources of leveling, which could be eliminated by the same instrument-staff distance for backsight and foresight readings. (4)
8. Explain the two-peg-test of the tilting level (4)

**Trigonometric heighting**

9. Explain the formula of the trigonometric heighting (3)
10. What is the advantage and disadvantage of trigonometric heighting compared to leveling? (4)
11. How far reaches the combined effect of curvature and refraction the level of 15 cm? (3)

**Angular observations**

12. The structure of the theodolite (figure, labels) (5)

13. Draw the view of the graduated microscope! The unit of the main scale is  $1^\circ$ , the sub-scale have 60 units, and the reading is  $256^\circ 23,5'$ ! (4)
14. Explain the procedure of the set up of the theodolite! (5)
15. What is the normal point of the bubble tube? (3)
16. How can the normal point of the bubble tube be found? (3)
17. List the instrumental systematic error sources of the theodolite and the ways of their reduction/elimination! (3)
18. List the systematic error sources caused by external condition, and set up. Give the ways of their elimination (3)
19. Explain the procedure of the adjustment of the theodolite. (6)
20. How high is the effect of the collimation error of  $28''$  on the horizontal reading, if the zenith angle of the line of sight is  $60^\circ$ ? (3)
21. How high is the effect of the misalignment of the transit axis of  $28''$  for the line of sight of  $60^\circ$ . (3)
22. Give the formula of the reduction of excentric observations (+figure) (4)

### Distance observations

23. Compute the horizontal distance from the slope distance of 123,45m. The elevation of the endpoints are 148,5 and 151,5m above MSL respectively. Compute the horizontal distance projected to the MSL as well (radius of the Earth is 6380km) (5)
24. How high is the correction of the 50m-long tape due to the temperature change of  $+10^\circ\text{C}$ ? The expansion coefficient is  $1,1 \times 10^{-5} 1/^\circ\text{C}$ . (3)
25. Explain the procedure of the electronic distance measurements (figure + formulae) (5)

### Plane Surveying

26. The coordinate system used in surveying, the whole circle bearing, computation of the reverse whole circle bearing, transferring whole circle bearings. (5)
27. 1<sup>st</sup> fundamental task of surveying. (2)
28. 2<sup>nd</sup> fundamental task of surveying. (3)
29. In which quadrant is the WCB when both the Easting and Northing coordinate differences are negative? (2)
30. Foresection with inner angles (figure+computation) (4)
31. Foresection with whole circle bearings (figure+computation) (4)
32. Arc-section (figure+computation) (4)
33. Resection (figure+computation) (6)
34. Orientation of Mean Directions, computing the mean orientation angle. (4)
35. List the types of traverses. (4)
36. The closed-line traverse (figure, computation) (8)
37. The inserted traverse (figure, computation) (6)
38. Finding blunders in angular observations of a closed line traverse (4)

### Setting out

39. Describe the procedure of the alignment from the endpoint (setting out straight lines), when the distances are not observable! (figure, formulae) (5)
40. Describe the procedure of the alignment from the endpoint (setting out straight lines), when the distances are observable! (figure, formulae) (5)
41. Describe the procedure of the alignment using the unknown point (setting out straight lines), when the distances are not observable! (figure, formulae) (5)
42. Describe the procedure of the alignment using the unknown point (setting out straight lines), when the distances are observable! (figure, formulae) (5)
43. Describe the procedure of the setting out of straight lines through obstacles! (figure, formulae) (5)

44. Describe the procedure of the setting out of horizontal angles using the theodolite (figure, formulae) (5)
45. Visualize the chainage and offset quantities used in offset surveys on a figure! (2)
46. Visualize the quantities required for polar setting out! (2)
47. Describe the method of the setting out of points with a defined elevation! (5)
48. How could the arc length be computed based on the central angle and the radius? (2)
49. What is the tangent length? How can it be computed based on the central angle and the curve radius? (3)
50. What are the principal points of curves?
51. Describe a procedure of the setting out of the principal points on a curve! (figure, formulae) (5)