



Answer the following questions:

THE FIRST QUESTION (18 MARKS) :

From point O the points A,B and C have been observed by an instrument having constants (100,0). The observations are as follows:

Instrument point	Staff point	Bearings	Vertical angles	Stadia readings
O	A	00' 00"	Zero	1.10,2.10,3.10
	B	45' 00"	Zero	0.60,1.60,2.60
	C	90' 00"	Zero	1.45,2.45,3.45

It is required to:

- 1- Calculate the gradient between the two points A and B.
- 2- Determine all the necessary data required for setting out the curve passing through points A,B and C with center O by the method of offsets from the two tangents.

THE SECOND QUESTION (12 MARKS) :

An angle observed 10 times, the results was the same in degrees and minutes as $34^{\circ} 34'$ and the seconds as follows: 14",12",13",15",13",12",10",14",13",13". Determine the most probable value for the angle and state if one of them may rejected and why.

THE THIRD QUESTION (12 MARKS) :

The horizontal distance H and the difference in level V between the instrument and vertical staff were measured by stadia system. The instrument constants (100,0). The required observations were: the mean vertical angle ($3^{\circ} 22' \pm 1'$), the mean distance on the staff (2.74 ± 0.03 m). Determine the most probable values for H and V.

THE FOURTH QUESTION (18 MARKS) :

A vertical symmetrical curve is to be introduced between the grades -2% and $+4\%$. The chainage and the reduced level of the point of vertical intersection are 1500 m and 0.00 m respectively, the length of the curve is 400 m, its required to:

- 1- Calculate the reduced levels of the various stations set out at 40 m intervals along the curve.
- 2- Find the reduced levels and chainage of the lowest point of the curve.
- 3- Draw briefly the curve with scale 1:2000 and show all the data on the curve.

PLEASE TURN OVER



THE FIFTH QUESTION (20 MARKS):

The following readings were obtained in a leveling job for constructing a tunnel: 1.73, 2.17, 2.85, 0.14, (0.37), (0.65), (0.70), (0.45), 0.98, 2.76, 0.77, 0.12, 1.91, 1.78, 2.16, 0.75, 2.00, 3.53, 0.16 and 2.88 m. The level was changed after the second, fourth, sixth, seventh and ninth points. The readings of the second, fifth, sixth and tenth points were taken on the ceiling of the tunnel. The readings between brackets were soundings on the floor of the tunnel. Put your results in full table and it is required to:

- 1- Find the reduced levels of all the points if the reduced level of the sixth point was 1.15 m under mean sea level, check your results.
- 2- Find the reduced levels of all the soundings if the reduced level of the eighth point was the water surface in tunnel.
- 3- Compute the maximum difference in the reduced levels for the points leveled at the ceiling of the tunnel.

THE SIXTH QUESTION (12 MARKS):

The following reads were taken when constructing a new road:

Chainage (m)	0.00	200.00	400.00	600.00	800.00
Reduced level (m)	17.40	19.50	18.30	19.20	20.00

The width of the new road 10.0 m, the right side slope was 3 horizontal and 2 vertical and the left side slope was 2 horizontal and 1 vertical. The reduced level of the point of chainage 200.00 m was 20.00 m and the uniform slope of the road was 0.50% to the down. It is required to:

- 1- Compute the volume of cut or fill.
- 2- Draw the longitudinal section with 1:5000 horizontally and 1:50 vertically.

THE SEVENTH QUESTION (18 MARKS):

The following readings were taken for an anticlockwise closed traverse ABCDA:

point	Horizontal angle	Line	Distance (m)
A	132° 15' 30"	AB	0637.88
B	126° 12' 54"	BC	1576.20
C	069° 41' 18"	CD	3824.10
D	031° 50' 30"	DA	3133.72

Line AB refers to the north exactly and the coordinates of point A is (4000 E,5000 N).

It is required to:

- 1- Correct the traverse.
- 2- Compute the coordinates of all the points of the traverse.
- 3- Compute the area of the traverse using the coordinate method.

GOOD LUCK

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