



Question (1)(30%)

(Answer by sketch as possible)

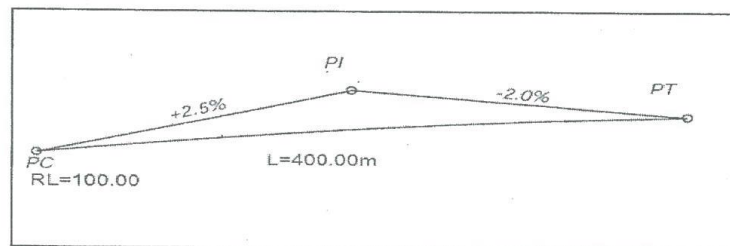
- a) Readings were taken on a vertical staff held at points A , B and C with a tacheometer has constant is 100. If the horizontal distances from instrument to staff were respectively 45.9, 63.6 and 89.4 m, and the vertical angles likewise $+5^\circ$, $+6^\circ$ and -5° , calculate the staff intercepts. If the mid-hair reading was 2.100 m in each case, what was the difference in level between A , B and C ?
- b) A theodolite has a multiplying constant of 100. When set 1.35 m above station B , the following readings were obtained .

Station	Sight	Horizontal circle	Vertical circle	Stadia readings (m)
B	A	$28^\circ 21' 00''$		
B	C	$82^\circ 03' 00''$	$20^\circ 30'$	1.140 2.292 3.420

The coordinates of A are 163.86 E , 0.0 N , and those of B , 163.86 E, 118.41 N. Find the coordinates of C and its height above datum if the level of B is 27.3 m

Question (2)(20%)

- a) A Circular curve is to be set out so that it is tangential to three straight lines AB , BC , CD . The bearing of these straight lines are 34° , 74° , 124° , the length of the line $BC = 210.50$ m. Calculate the radius and the length of the curve, Set out the curve by coordinates from the long chord.
- b) What type of the curve and calculate the reduced levels at 50 m intervals along the curve.



Question (3)(30%)

a) A Compound curve ABC, the intersection angle of the curve = 114° the length of the first tangent = 520 m , the radius of the first curve = 300m , the radius of the second curve = 440m . Determine the length of second tangent and the angles of deviation.

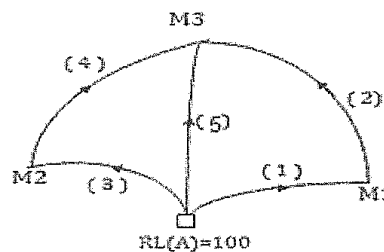
b) In the levelling network, point A is a benchmark and has an assumed height of 100.00 m. Levelling has been undertaken along the lines as shown. The observed height differences as the following:

By Parametric method compute the adjusted values

Line	Height difference	length
AX	12.483m	5 km
AY	48.351m	10 km
AZ	5.492m	7 km
XY	35.883m	7 km
XZ	-7.093m	12 km
YZ	-42.956m	9 km

c) For the level net shown in figure .By **Conditions method**. Wright the required matrix to adjust the unworn values (M1 ,M2)

Line (m.)	Length (m.)	Elev. Difference (m.)
1	3	+ 1.05
2	3	- 0.96
3	2	+ 2.13
4	2	- 1.96
5	1	+ 0.10



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Question (4)(20)

- a) The images of points A and B appear on two overlapping vertical photographs. The flying height above datum was 4050 ft and the air base is 2410 ft. the focal length of the camera is 6-in. the coordinates are measured of the left photo as $x_a = 2.10$ in, $x_b = 3.50$ in, $y_a = 2.00$ in and $y_b = -1.05$ in. also, of the right-hand photo, $x_{1a} = -2.25$ and $x_{1b} = -1.17$. Find the length of the line AB and the elevation of points A and B.
- b) Aerial photography is to be taken for an area of land as the trapezoidal shape with two parallel bases; the shorter of them measures 5.25 miles and the longer measures 7.5 miles while the height between the two bases is 4.5 miles and one edge is perpendicular to the two bases and the other is inclined to them. The intended flying height is to be 1500 m above the average terrain and the focal length of the camera to be used is 6 in where focal plane dimensions are 9'' by 9''. Calculate the number of flying lines, the number of photos per one flying line and the total number of photos required to cover the whole area taking into account that the end lap is not less than 60% and the sidelap is not less than 30%.

Good Luck