



This exam measures the following ILOS: a-5, a-13, b-17, c-13, c-14, d-1

(Answer by sketch as possible)

Question (1)

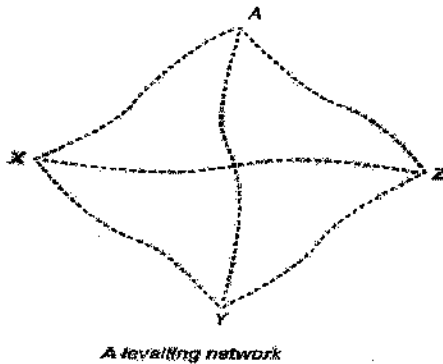
- a) Readings were taken on a vertical staff held at points A , B and C with a tacheometer whose constants were 100. If the horizontal distances from instrument to staff were respectively 45.9, 63.6 and 89.4 m, and the vertical angles likewise $+5^\circ$, $+6^\circ$ and -5° , calculate the staff intercepts. If the mid-hair reading was 2.100 m in each case, what was the difference in level between A , B and C ? (10 Mark)
- b) Two straights AB and LC meet at an inaccessible point M . A circular curve of 400 m radius is to be set out joining the two straights. The following angles were collected: $ABL = 157^\circ 20'$, $CLB = 164^\circ 35'$, $BL = 150$ m. Calculate the necessary data for setting out the curve by the method of offsets from tangent. The chain to be used is of 20 m length, and the chainage of B is (58 chains). (15 Mark)
- c) Two straights AB and BC falling to the right at gradients 10% and 5%, respectively, are to be connected by a parabolic curve 200 m long. Design the vertical curve for chainage and reduce level of B as 2527.00 m and 56.46 m, respectively. Take peg interval as 20 m. (10 Mark)

Question (2)

- a) The bearing and length of traverse are $38^\circ 45' 20''$ and 169.08m respectively. If the standard deviations of the two observations are $\pm 20''$ and $\pm 50''$ mm, respectively, calculate the standard deviations of the coordinate difference of the line. (10 Mark)
- b) A compound curve LMN , radius of curve $LN=400$ m and the length $LN= 80$ chain and the its bearing $140^\circ 20'$. The bearing of line $LS = (25^\circ N 30^\circ E)$ and the bearing of line $NS = (76^\circ N 30^\circ W)$. Determine the coordinates of point M and the length of the second tangent. (Note point S is the intersection point) (10 Mark)
- c) Discuss in detail with sketch three different methods used to setting out the horizontal curve. (5 Mark)
- d) Compare with sketch between stadia hair and tangent methods (5 Mark)

Question (3)

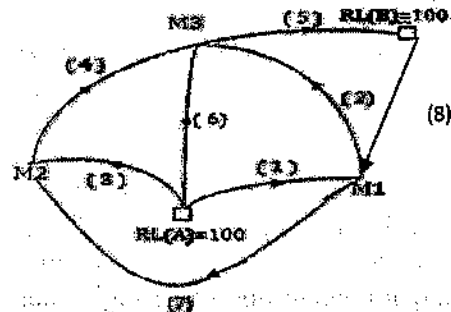
- a) In the levelling network in *Figure*, point *A* is a benchmark and has an assumed height of 100.00 m. Levelling has been undertaken along the lines as shown. The observed height differences were: Adjust by Condition equation (15 Mark)



Line	Observed height difference	Approximate line 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

- b) For the level net shown in figure, Write down in only matrix form by Observation method (10 Mark)

Line	Length (m)	Elev. Difference
1	4	1.02
2	4	2.03
3	2	-2.4
4	2	1.90
5	1	0.05
6	3	-1.09
7	4	1.06
8	1	-1.05



Question (4) (10 Mark)

- 1- A vertical photograph taken from an elevation of 2400 m above mean sea level MSL with a camera having a 180 mm focal length contains the image of a tall vertical radio tower. If the datum line (MSL) is located under the middle of this tower by 40 m, and the radial distance to the top and the base of the tower from the photo center were 138, 114 mm respectively. What is the height of the tower?
- 2- A pair of overlapping vertical photographs was taken from a flying height of 5000 m above ground with a 152.4 mm focal length camera having a 17.78 cm square format, if the photos were taken with 60 percent end lap. Flight line coordinates for points a and b in the first photo were measured as $x_a = -56$ mm, $y_a = 43$ mm, $x_b = 38$ mm, $y_b = -22$ mm, if the elevations of points A and B are 110 and 280 m respectively. Calculate flight line coordinates for points a and b in the second photo and the horizontal length AB?

Good Luck
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