

UNIVERSITY OF LONDON
B.Sc. (ENGINEERING) EXAMINATION 1963

PART II

for Internal and External Students

(10) SURVEYING

Wednesday, 12 June: 2.30 to 5.30

Answer SIX questions.

1. Readings were taken on a vertical staff held at points A, B and C with a tacheometer whose constants were 100 and 0. If the horizontal distances from instrument to staff were respectively 153, 212 and 298 ft and the vertical angles likewise $+5^\circ$, $+6^\circ$ and -5° , calculate the staff intercepts.
If the middle-hair reading was 7.00 ft in each case what was the difference of level between A, B and C?
2. A piece of ground has a uniform slope North to South of 1 vertical to 20 horizontal. A flat area 200 ft by 80 ft is to be made by cutting and filling, the two volumes being equal. Compare the volumes of excavation if the 200 ft side runs (a) North to South (b) East to West. The side slopes are to be 1 vertical to 2 horizontal.
3. Sea-bed contours are to be plotted offshore from a gently sloping beach.
 - (a) Describe three methods of locating the soundings, listing the equipment required.
 - (b) Describe in detail the full procedure to obtain the contours noting the equipment and men required.
4. A reverse curve is to start at a point A and end at C with a change of curvature at B. The chord lengths AB and BC are respectively 661.54 ft and 725.76 ft and the radii likewise 1200 and 1500 ft. Due to irregular ground the curves are to be set out using two theodolites and no tape or chain. Calculate the data for setting out and describe the procedure in the field.

5. The following is an extract from a level book:

B.S.	I.S.	F.S.	Red. Level	Remarks
4.20				Point A
2.64	2.70	11.40	119.30	C.P., B.M. 119.30
	3.42			
	9.51			
	11.74			
2.56		13.75		C.P.B.
	3.10			
	6.91			
3.61		11.23		C.P.C.
	5.60			
12.98		3.61		C.P.C.
13.62		3.31		C.P.B.
12.03		2.51		C.P., B.M.
		4.83		Point A

- (a) Reduce the above levels,
 (b) If you consider a mistake has been made suggest how it occurred,
 (c) Give reasons for your choice of 'Rise and Fall' or 'Height of Collimation' for reducing the levels.

The B.S. and F.S. lengths were approximately equal.

6. A traverse ACDB is surveyed by theodolite and chain. The lengths and quadrantal bearings of the lines AC, CD and DB are given below. If the co-ordinates of A are $x=0$, $y=0$ and those of B are $x=0$, $y=+897.05$, adjust the traverse and determine the co-ordinates of C and D. The co-ordinates of A and B must not be altered.

Line	AC	CD	DB
Length in ft	480.6	292.0	448.1
Bearing	N 25° 19' E	N 37° 53' E	N 59° 00' W

7. How would you test and adjust a transit theodolite with a vertical circle index error, when the operation of the clip screw
 (a) changes the elevation of the telescope and
 (b) does not change the elevation of the telescope?
 Assume that the altitude bubble is mounted on the index arm carrying the vertical circle verniers.

8. The angles measured by a theodolite from two stations A and B are tabulated below. The horizontal distance AB is 745.9 ft. If the R.L. of target at B is 534.09 ft, find the R.L. of the elevated signal C.

At Station	Sight	Horizontal Angle	Vertical Angle
A	B	169° 44' 20"	0° 00' 00"
A	C	229° 18' 20"	18° 33' 00"
B	A	12° 37' 00"	—
B	C	298° 22' 00"	—

9. Obtain an expression relating the length of a horizontal transition curve and the radius of the circular arc for a track 4 ft 8½ in wide when the cant is 6 in and the rate of change of acceleration is 1 ft/sec²/sec. Why does this expression give a short transition for a small radius, and a long transition for a large radius?

D. GADD
F. C. SCOTT

372 37
298 22

74 15

Line length latitude departure.

2680
2640
4970

9890