

2306/302
SURVEYING
Oct./Nov. 2011
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN QUANTITY SURVEYING

SURVEYING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Scientific Calculator.

Answer any FIVE of the following EIGHT questions.

All questions carry equal marks.

Maximum marks for each part of a question are as shown.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. Table 1 shows level readings taken at P, Q and R in order to extend a sewer line from P to Q and R, on a falling gradient of 1 in 150 at distances of 27.12m and 54.11m consecutively:
- Draw a diagram to illustrate the situation.
 - Reduce the observations.
 - Calculate the difference in level between the top of each opeg and the top of each sight rail at P, Q and R respectively if a 2.5m boning rod is to be used.

(20 marks)

Table 1

B.S	I.S	F.S	H.C	R.L	Remarks
0.390					TBM (89.52M AD)
	0.160				Top of wooden peg @P
	0.350				Top of wooden peg @ Q
	1.170				Top of wooden peg @ R
		2.840			Existing server
					Invert @ P

2. (a) With the aid of a diagram, outline the procedure for:
- Direct chaining on a sloping ground.
 - Setting out a perpendicular from a point on the chain line without using an angle measuring instrument.
- (10 marks)
- (b) A straight line is to be established between two points A and B, the co-ordinates of which are given in Table 2. A point D is to be fixed exactly midway between A and B but it is not possible to measure along AB directly. If D is to be fixed from C, calculate:
- The co-ordinates of D
 - The length and bearing CD
 - The clockwise angle to be set out at C relative to CA in order to fix the position of D.

(10 marks)

Table 2

Station	N	(m)	E
A	1 000.00		1 000.00
B	1 256.00		4 014.00
C	2 398.00		2 764.00

3. (a) List **five** permanent adjustment of a theodolite that should be tested from time to time. (5 marks)
- (b) Outline the procedure for temporary adjustment of a theodolite. (9 marks)
- (c) The following is an extract from a field note of horizontal angles taken from station TR₁ on both face left and face right.

@ TR₁

TR ₂	TP ₁	TR ₃
136° 33' 14"	279° 11' 40"	348° 00' 10"
91 33 14	234 11 36	303 00 20

- (i) Reduce the observations.
- (ii) State reason for face left and face right readings. (6 marks)
4. (a) State the purpose of traversing. (2 marks)
- (b) Table 3 is an extract from a traverse computations between two fixed points K₁ and K₂ whose co-ordinates are (- 138 413.42m(N), -39 420.60m(E) and (-138 504.62 m(N), - 38 922.02 m(E) respectively.

Table 3

Line	Length	DN	DE
K ₁ - P ₁	178.18	101.85	146.20
P ₁ - P ₂	215.24	89.63	195.69
P ₂ - P ₃	100.09	14.94	98.97
P ₃ - P ₄	178.66	-175.67	-32.54
P ₄ - K ₂	151.82	-122.03	90.32

- (i) Evaluate the accuracy of the traverse.
- (ii) Using Bowditch's method, determine the adjusted co-ordinates of P₁,.....P₄. (18 marks)

5. (a) State five characteristics of contours. (5 marks)
- (b) Describe the direct method of contouring. (9 marks)
- (c) A back sight of 1.78m is taken onto a Benchmark of reduced level 651.87m. Determine the staff readings required to locate 650, 651, 652 and 653m contours respectively. (6 marks)

6. (a) In a vertical staff tacheometry,

$$(i) \quad H = K S \cos^2 \theta + C \cos \theta$$

$$\text{and } (ii) \quad V = \frac{1}{2} K S \sin 2 \theta + C \sin \theta$$

Identify the parameters in the equation (i) and (ii). (5 marks)

- (b) A theodolite fitted with analactic lens and having a multiplying constant of 100 was set up at station P whose reduced level is 1024.260m. Readings shown on Table 4 were then taken on the staff held vertically at stations A and B. If the height of instrument above the ground at P was 1.320m; calculate

(i) Horizontal distances PA, PB and AB.

(ii) The difference in height between A and B. (15 marks)

Table 4

Staff position	Bearing		Vertical Angle		Staff reading(m)		
	Top	mid	Top	mid	bottom		
A	213°	34'	+1°	15'	2.684	2.095	1.505
B	303	34	-2	04	2.745	1.967	1.188

7. (a) With the aid of a diagram, describe the field procedure of locating target points of a simple circular curve when the intersection point is inaccessible. (10 marks)
- (b) Figure 1 shows a simple circular curve of radius R. derive an expression for determining the offset distance (x) at (y) distance from tangent point N. (4 marks)

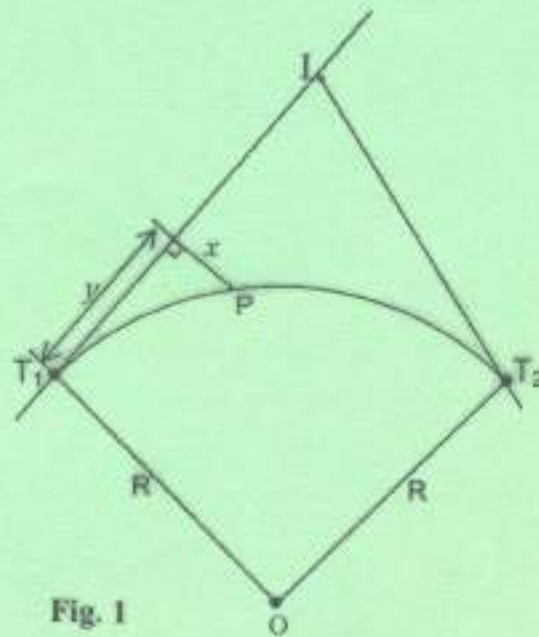


Fig. 1

- (c) It is required to connect two straights whose deflection angle is $13^{\circ} 16' 00''$ by a circular curve of radius 600m. Calculate the lengths of the initial sub-chord if the through chainage of the intersection point is 2745.72m and standard chord length is 25m. (6 marks)

8. (a) Define the following terminologies as used in Mass Haul Diagrams.

- (i) Haul distance
- (ii) Over haul
- (iii) Free haul
- (iv) Waste
- (v) Borrow

(5 marks)

- (b) Outline **three** uses of Mass Haul Diagrams.

(6 marks)

- (c) Using the information shown in Figure 2, calculate the side widths and the area of the cross-section.

(9 marks)

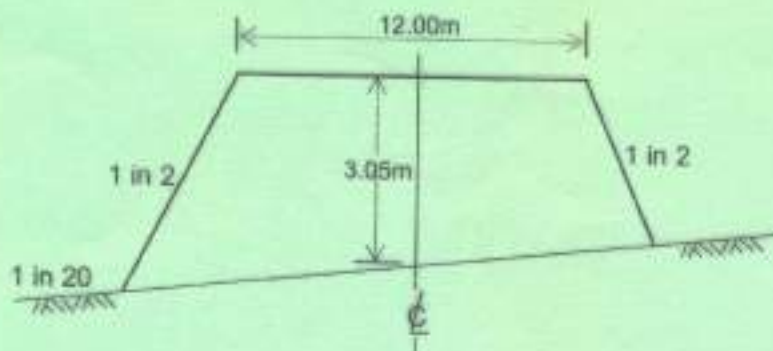


Fig 2