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Diploma in Construction Technology		
NVQ Level 05 –Semester I		
Surveying and Leveling	F45C001M06	Three Hours
Answers five (05) questions only		

1. “Surveying is generally used for Planning and construction of building, bridges and drainage work”.

- (i) Briefly explain the term “chain surveying”? (2 Marks)
- (ii) Differentiate plan and map. (4 Marks)
- (iii) List out all the instruments required for the following activities.
 - 1. Traversing
 - 2. Leveling (4 Marks)
- (iv) While measuring a chain line AB with the length of 30m below records were noted. Prepare the page of surveying field book. (Please fulfill all details using appropriate scale). (10 Marks)

Chainage (m)	Offset		Remarks
	Distance(m)	Left/Right	
2.5	4.5	Right	Jack tree
3.5	4.0	Left	Light post 1
5.5	4.5	Right	‘P1’ Conner of rectangular building (8m×10m)
7.5	3.0	Left	Side road edge
9.5	4.0	Right	Palm tree
11.0	2.0	Right	Side road edge
13.0	4.5	Right	Manhole 1
14.0	5.0	Right	Manhole 2
15.5	4.5	Right	‘P2’ Conner of above building
19.0	3.3	Left	Side road edge
21.5	3.9	Right	Manhole 3
22.0	4.0	Left	Lamp post 1
24.0	2.2	Right	Side road edge
26.5	4.2	Left	Light post 2
28.0	4.0	Right	Manhole 4
29.5	4.5	Right	Jack tree

2. (i) Briefly explain the follow terms in traversing:

- a) Whole circle bearing
- b) Open traverse

(4 marks)

(ii) A land survey was made with the identified survey stations A, B, C and D as given in the figure 1. Using the following table,

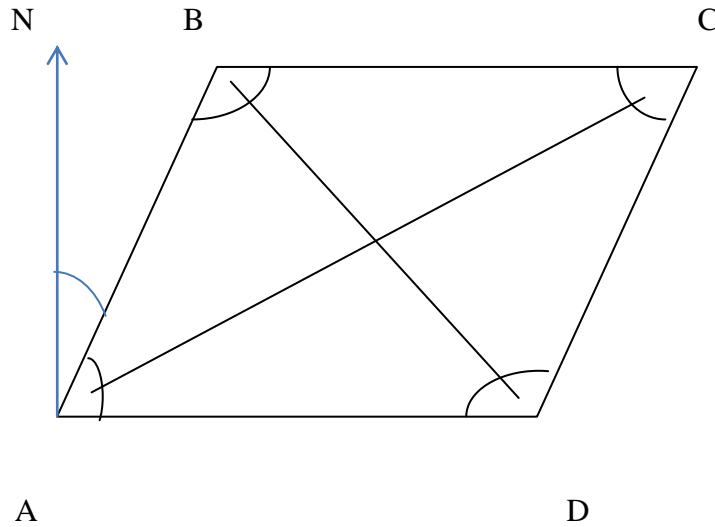


Figure 1

AN shown as north Angle NAB = $5^{\circ} 6' 18''$

Line	Length (m)	Angles	Angles
AB	255	^ P	$93^{\circ} 18' 16''$
BC	656	^ Q	$74^{\circ} 16' 25''$
CD	120	^ R	$123^{\circ} 42' 00''$
DA	668	^ S	$68^{\circ} 41' 11''$

- a) Find out the angular error and correction. (2 Marks)
- b) Calculate the whole circle bearings for the above each corrected angle using clockwise approach (4 Marks)
- c) Calculate latitude and departure of each survey lines (AB, BC, CD, DA) and calculate Corrected latitude and Departure (6 Marks)
- d) Illustrate coordinates for each survey station (A,B,C,D) (4 Marks)

3. “The irregular boundary is measured by Simpson’s and Trapezoidal rules using offsets to calculate the area”.

- (i) State the Simpson’s and trapezoidal rules to find out the area enclosed by the irregular boundary. (4 Marks)
- (ii) Using the given table, calculate the area enclosed between the chain line and the irregular boundary up to the end offset by Simpson’s rule and Trapezoidal rule. (12 Marks)

Distance (m)	0	5	10	15	20	25	30	35	40
Offset (m)	2.50	3.00	3.25	3.75	3.95	4.05	4.25	4.55	4.65

- (iii) Calculate the area enclosed by irregular boundary (m^2) for the given figure 2 drawn to a linear scale of 1:400, each square (10×10 mm). (4Marks)

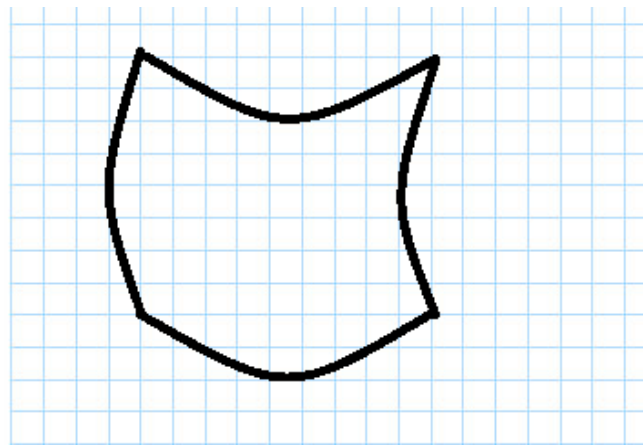


Figure 2

4.

- (i) Define the following terms in leveling
 1. Bench Mark
 2. Back sight (B.S)
 3. Fore sight (F.S)
 4. Temporary bench mark (4 Marks)
- (ii) The following staff readings were successively taken with instruments in leveling Work. 0.38, 0.43, 0.32, 0.62, 0.73, 0.94, 1.75, 2.15, 2.60, 2.95, 2.68, 1.22, 1.95, 0.85 m,
 The position of the instrument was changed after 4th, 7th, 11th readings.
 Calculate the reduced levels of all points by assuming the reduced level of 1st point is 45m. (10 Marks)

- (iii) The following staff readings table were successively taken with instruments in leveling work, by adding the back sight on P (1.200) to the reduced level of (44.350), height of collimation (45.550) at instrument station 1, station 2 (S) (44.162) and station 3 (U) (42.710). Use height collimation method and fill the table.

Back sight	Inter sight	Fore sight	Height of collimation	Reduced level	distance	Remarks
1.200			45.550	44.350		P
	1.391					Q
	2.885					R
1.092		2.480	44.162			S (Change point)
	1.800					T
0.855		2.307	42.710			U(Change point)
		1.227				V
3.147		6.014				

(6 Marks)

5. “In civil engineering, calculation of volumes is essential for construction works”

- (i) State three main purposes of calculating the volume in construction? (4 Marks)
- (ii) Use given figure 3, calculate the volume of excavation, proposed level of basement is 146 m, total area is 30m². (6 Marks)

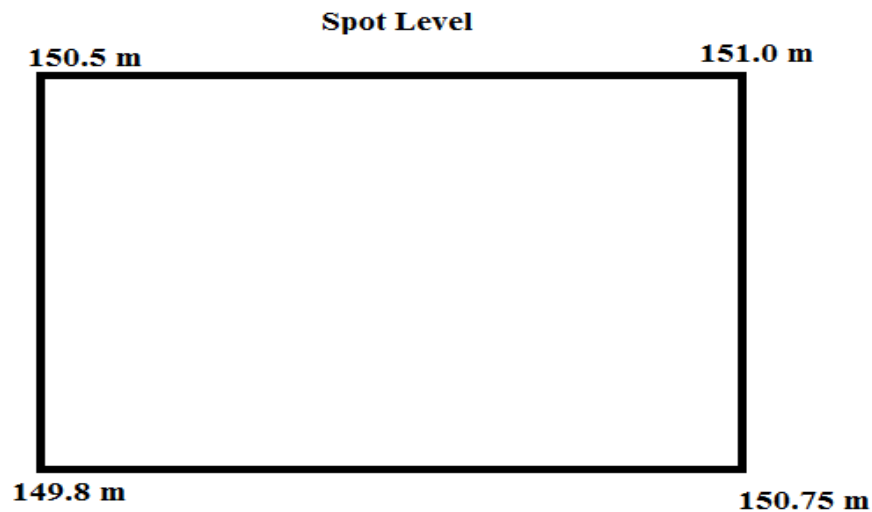


Figure 3

- (iii) State three benefits of the contour level survey. (4 Marks)
- (iv) Using given figure 4, calculate the volume of water tank and use areas of contours 125, 126, 127, 128, 129, 130 and areas are $A_1, A_2, A_3, A_4, A_5, A_6$ ($A_1=3\text{m}^2, A_2=8\text{m}^2, A_3=12\text{m}^2, A_4=6\text{m}^2, A_5=5\text{m}^2, A_6=3.5\text{m}^2$). Proposed level of water tank is 122 m. (6 Marks)

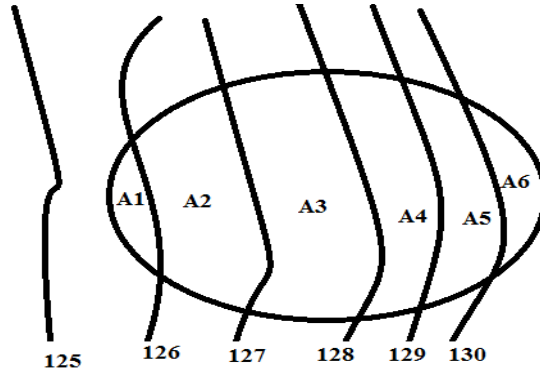


Figure 4

6. The area of the sloppy forest land needs to be surveyed to estimate the area.
- (i) Give the steps to be followed to complete activity using most suitable surveying method. (4 marks)
- (ii) List the instruments required for above suggested land surveying method. (3 marks)
- (iii) The following offsets were taken from a chain line (one side) and irregular boundary line at an interval of 10 m.
 0, 2.5 m, 3.5 m, 5.00 m, 4.60 m, 3.20 m, 0 m
- a. Draw a sketch of the area showing the offset readings taken. (4 marks)
- b. Compute the area between the chain line and the irregular boundary line (9 marks)