Fall Semester -Final Exam. (2022-2023) Typical Answers

University of Salahaddin-Erbil Subject :Construction Surveying

College of Engineering Time Allowed : 150 min

Geomatics (Surveying) Engineering Dept. Examiner : Azad Arshad Hawezi

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Note ; Round off the results to two digits after the point . or close accuracy to cm only

Question 1) (40mark)

Find h ,h1 ,h2, w1 ,w2 and elevation of catch points A ,B and elevation of top of slope rails (P,Q,S,T) of an Excavation cross section of 1:2 side slope formation level of the road is 393.33 m road width is 12.5 m, the bench mark at left side is 400.05 m ,the staff reading on bench mark was 3.16 m and staff reading on the center line of cross section is 4.87 m , , points P,Q are at left side of center line and points S,T are at right side of center line , points , Q and S are nearest from the sloping stakes at 1 m distance ,slope rail horizontal width is 1 m , the traveler is 1.80 m, tolerance is 5 cm , staff reading trials and distances from center line was as follows

Left side		Right side	
Staff reading m	Distance m	Staff reading m	Distance m
4.44	17.15	3.59	18.91
4.80	16.55	4.22	15.55
4.93	16.25	4.53	17.08

Solution :

HI = 400.05 m +3.16 m = 403.21 m

d =HI-Formation level = 403.21 m-393.33 m = 9.88 m

h= 9.88 m-4.87 m =5.01 m

for left side :

9.88 m – 4.44 = 5.44 m

$$5.44 \text{ m} \times 2 + 6.25 \text{ m} \overset{?}{=} 17.15 \text{ m}$$

$$17.13 \text{ m} \overset{\checkmark}{=} 17.15 \text{ m}$$

h1 = 5.44 m , w1= 17.13 m or 17.15 m

for right side :

9.88 m – 3.59 m = 6.29 m

?

6.29 m x 2 + 6.25 m = 18.91 m

18.83 m ≠ 18.91 m

9.88 m – 4.22 m = 5.66 m

?

5.66 m x 2 + 6.25 m = 13.05 m

15.57 m = 15.55 m

h2 = 5.66 m , w2 = 15.57 m or 15.55 m

A= 403.21 m – 4.44 m = 398.77 m

Q= 398.77 m + 1/2 m +1.80 m = 401.07 m

P = 398.77 m + 1m+ 1.80 m = 401.57 m

B= 403.21 m – 4.22 m = 398.99 m

S= 398.99 m +1/2 m + 1.80 m = 401.29 m

T = 398.99 m +1 m + 1.80 m = 401.79 m

Question 2) (30mark)

Determine the amount of the Cut and the Fill from the top of the curb of 0.15 m above the edge of pavement , pavement width 12 m and gradient - 1% . the station and stake elevations are arranged in the following table, the profile gradient is + 1.5 % and elevation of station 0 + 00 is 397.42 m on the center line .

Station	Stake Elevation m
0 + 00	397.60
0 +10	397.70
0+20	397.65
0+ 22.3	397.80
0 + 26.7	397.90
0+30	400.00
0 + 40	400.00
0 +50	400.00

Solution :

From center line to the edge of the pavement 397.42 m – 6/100 = 397.36 m

The curb elevation of offset 0+00 = 397.36 + 0.15 = 397.51 m

From station 0+00 to station 0+10

For 10 m =397.42+ 10x 1.5 /100 = 397.57 m

For station 0+22.3 m = 397.42 + 22.3 x 1.5/100 = 397.75 m

For station 0+26.7 m = 400.50 + 8.5 x 2/100 = 397.82 m

Station	Crown m	Edge of the pavement m	Curb elevation m
0 + 00	397.42	397.36	397.51
0 +10	397.57	397.51	397.66
0+20	397.72	397.66	397.81
0+ 22.3	397.75	397.69	397.84
0 + 26.7	397.82	397.76	397.91
0+30	397.87	397.81	397.96
0 + 40	400.02	399.96	400.11
0 +50	400.17	400.11	400.26

Grade Sheet

Station	Curb elevation m	Stake Elevation m	Cut m	Fill m
0 + 00	397.51	397.60	0.09	
0 +10	397.66	397.70	0.04	
0+20	397.81	397.65		0.16
0+ 22.3	397.84	397.80		0.04
0 + 26.7	397.91	397.90		0.01
0+30	397.96	400.00	0.04	
0 + 40	400.11	400.00		011
0 +50	400.26	400.00		0.26

Question 3) (30 mark)

For setting out a curve find the chord distance from point PC to curb curve of length 20 m opposite the 45° deflection angle, take every 3 m distance on the curve, and find the elevation of same stake out points on the top of the curb if the elevation of PC above the curb is 400.46 m and elevation of point PT is under the curve is 400.21 m. curb high is 0.15 m.

Solution:

L /2 x22/7 R = Δ / 360° , 20 m /2 x22/7 R = 45° / 360°

R= 25.46 m

Θ / 360° = 3 m / 2x 25.46 m 22/7

Calculating chord distance from PT and beginning near PC

Θ = 6°. 75 R= 25.48 m Δ = 45° Θ/2=3 °.375

Point	Chord distance (m)
1	2R Sin (Θ) /2 = 2.98
2	2R Sin (2Θ) /2 = 5.99
3	2R Sin (3Θ) /2 = 8.95
4	2R Sin (4Θ) /2 = 11.95
5	2R Sin (5Θ) /2 = 14.78
6	2R Sin (6Θ) /2 = 17.62

400.21 + 0.15 = 400.36 m

400.46 m – 400.36 = 0.10 m

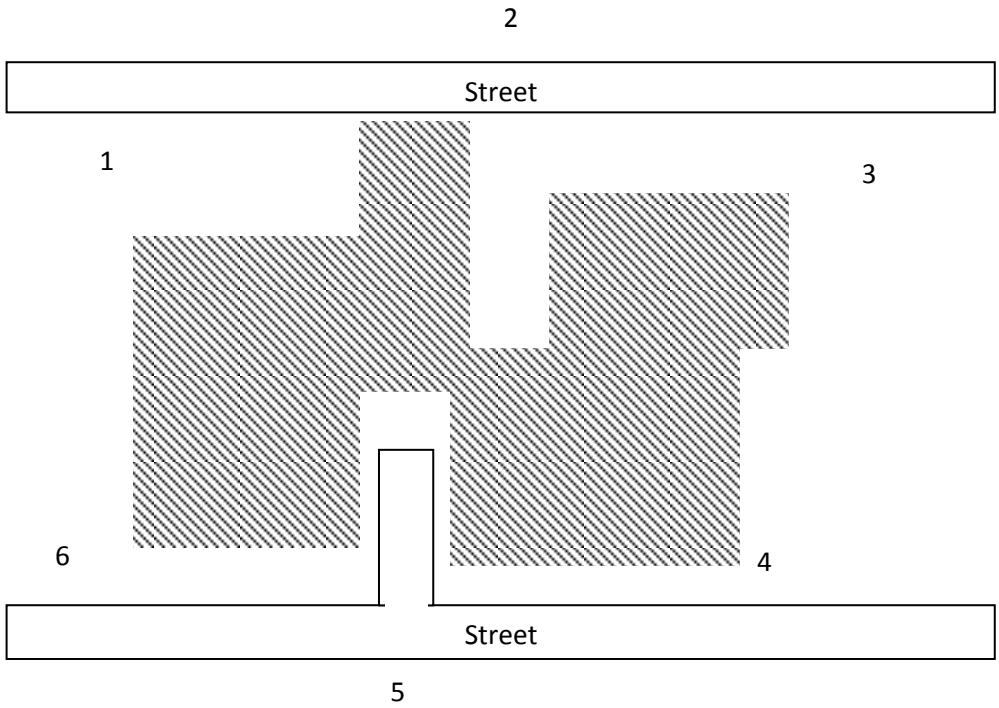
0.10 m /20 m = 0.005m for each meter

Point	Elevation m
PC	400.46
1	400.46 - (0.005 x 3) = 400.445
2	400.46 - (0.005 x 6) = 400.43
3	400.46 - (0.005 x 9) = 400.415
4	400.46 -(0.005 x 12) = 400.40
5	400.46 - (0.005 x 15) = 400.385
6	400.46 - (0.005 x 18) = 400.37
PT	400.36

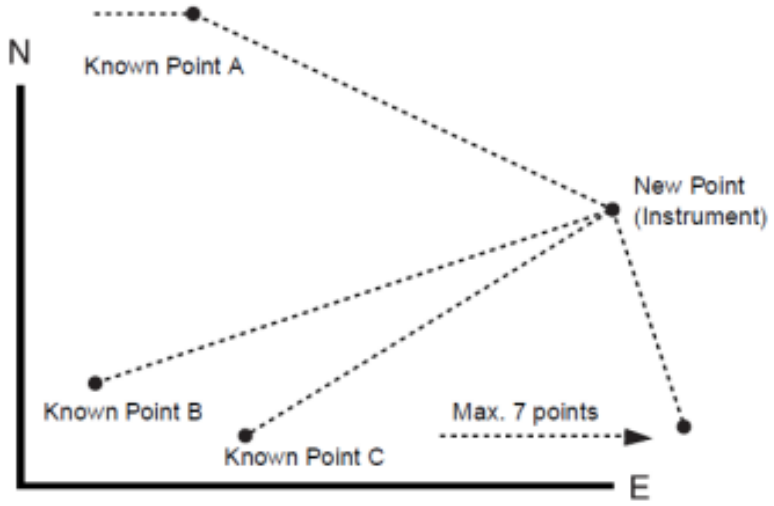
Practical Part:

<u>Question 1)</u> (50mark) (25+25)

a-For establishing a coordinate system for the following building redraw the map without scale and cover it with 6 control points for data collection consider line alignments between two neighboring control points



b-In surveying, free stationing (also known as resection) isa method of determining a location of one unknown point in relation to known points.



Question 2) (50mark)

Angle measurement

Page	Soft key	Display mark	Function
1	F1	0SET	Angle of Horizontal is set to 0°00'00"
	F2	HOLD	Hold the horizontal angle
	F3	HSET	Sets a required horizontal angle by entering numerals.
	F4	P1↓	The function of soft keys is shown on next page (P2).
2	F1	TILT	Setting Tilt Correction If ON, the display shows tilt correction value.
	F2	REP	Repetition angle measurement mode
	F3	V%	Vertical angle percent grade(%) mode

Distance measurement mode

Page	Soft key	Display mark	Function
1	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode, Fine/Coarse/Tracking
	F3	S/A	Select set audio mode
2	F1	OFSET	Select Off-set measurement mode
	F2	S.O	Select stake out measurement mode

Coordinate measurement mode

Page	Soft key	Display mark	Function
2	F1	R.HT	Sets a prism height by input values.
	F2	INSHT	Sets an instrument height by input values.
	F3	OCC	Sets an instrument coordinate point by input values.
	F3	m/f/i	Switches meter, feet or feet and inch unit.