

**Faculty Of Engineering  
Prince of Songkla University**

Mid-Term Examination  
August 4<sup>th</sup>, 2010  
221 – 361 Surveying II

1<sup>st</sup> Semester 2010  
Room Robot Auditorium  
Time: 13:30 - 16:30 (3 hours)

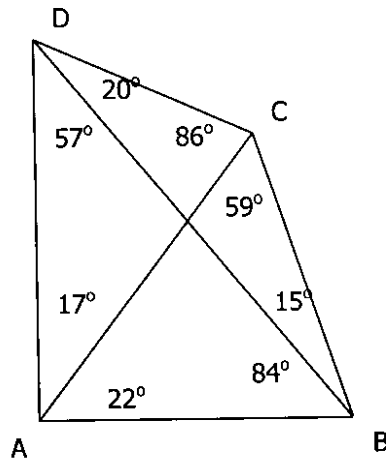
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**Instructions**

1. There are 5 problems in this exam. ( 100 points)
2. Attempt all problems.
3. Books and lecture notes are not allowed.
4. Students can bring in a calculator and a dictionary.
5. Students can use pencils in the answer books.

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นาย รุจ ศภวิไล ผู้ออกข้อสอบ



- Given a quadrilateral figure ABCD as shown in the sketch, AB is the measured base line. Compute the strength of figure for all possible routes that can be used in calculating the distance CD and the coordinates of stations C and D. All given angles are rounded off and expressed in degrees. (25 points)
- From the control stations A and B, the horizontal angles  $\angle PAB$  and  $\angle PBA$  were measured respectively. Please calculate the coordinates of the unknown station P ( $X_p$  and  $Y_p$ ) by using the given field data.

From	To	Face	Horizontal Circle Readings	Horizontal Angles	Remarks
A	P	L	203° 15' 21"		Angle $\alpha$
	B	L	283° 42' 59"		
	B	R	103° 42' 57"		
	P	R	23° 15' 23"		
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B	P	L	300° 07' 15"		Angle $\beta$
	A	L	245° 52' 38"		
	A	R	65° 52' 41"		
	P	R	120° 07' 20"		

Given  $X_A = 1,421,231.304$  m.       $X_B = 1,420,720.715$  m.  
 $Y_A = 521,304.009$  m.       $Y_B = 520,565.463$  m.      (20 points)

- 3) What is a "Laplace Station"? Explain the definition and usefulness of the Laplace station in surveying project. Also describe the type of surveying that needs the Laplace station. (10 points)
- 4) Describe the steps in computation for coordinates of the unknown point by the Italian's method of resection. (10 points) If it is required to write a computer program to solve for the unknowns by this method, what would you like to summarize the procedure of your computation into basic subroutines? (10 points)
- 5) From the given quadrilateral ABCD, please adjust the interior angles until they satisfy both geometric conditions and trigonometric condition. Also check the results of your final adjustment (25 points)

$$1 = 22^{\circ} 01' 42''$$

$$2 = 16 \ 44 \ 31$$

$$3 = 57 \ 08 \ 56$$

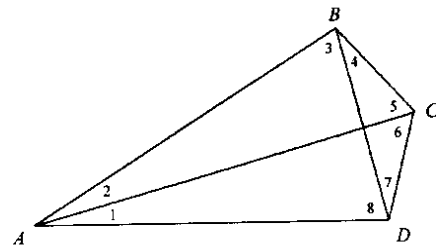
$$4 = 19 \ 33 \ 13$$

$$5 = 86^{\circ} 33' 13''$$

$$6 = 58 \ 46 \ 35$$

$$7 = 15 \ 06 \ 52$$

$$8 = 84 \ 04 \ 50$$




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**Table 10.3 Factors for Determining Strength of Figure (Courtesy U.S. National Ocean Survey)**  
 Values of  $(\delta_A^2 + \delta_B^2 + \delta_C^2)$  for various combinations of distance angles A and B of a triangle

	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	
10°	428	359																						
12	359	295	253																					
14	315	253	214	187																				
16	284	225	187	162	143																			
18	262	204	168	143	126	113																		
20°	245	189	153	130	113	100	91																	
22	232	177	142	119	103	91	81	74																
24	221	167	134	111	95	83	74	67	61															
26	213	160	126	104	89	77	68	61	56	51														
28	206	153	120	99	83	72	63	57	51	47	43													
30°	199	148	115	94	79	68	59	53	48	43	40	33												
35	188	137	106	85	71	60	52	46	41	37	33	27	23											
40	179	129	99	79	65	54	47	41	36	32	29	23	19	16										
45	172	124	93	74	60	50	43	37	32	28	25	20	16	13	11									
50°	167	119	89	70	57	47	39	34	29	26	23	18	14	11	9	8								
55	162	115	86	67	54	44	37	32	27	24	21	16	12	10	8	7	5	4						
60	159	112	83	64	51	42	35	30	25	22	19	14	11	9	7	6	5	4	4					
65	155	109	80	62	49	40	33	28	24	21	18	13	10	7	6	5	4	3	2	2				
70°	152	106	78	60	48	38	32	27	23	19	17	12	9	7	5	4	3	2	2	1	1			
75	150	104	76	58	46	37	30	25	21	18	16	11	8	6	4	3	2	2	1	1	1	1		
80	147	102	74	57	45	36	29	24	20	17	15	10	7	5	4	3	2	1	1	1	0	0	0	
85	145	100	73	55	43	34	28	23	19	16	14	10	7	5	3	2	2	1	1	0	0	0	0	0

90°	143	98	71	54	42	33	27	22	19	16	13	9	6	4	3	2	1	1	1	0	0	0	0	0
95°	140	96	70	53	41	32	26	22	18	15	13	9	6	4	3	2	1	1	0	0	0	0	0	0
100	138	95	68	51	40	31	25	21	17	14	12	8	6	4	3	2	1	1	0	0	0	0	0	0
105	136	93	67	50	39	30	25	20	17	14	12	8	5	4	2	2	1	1	0	0	0	0	0	0
110	134	91	65	49	38	30	24	19	16	13	11	7	5	3	2	2	1	1	1	0	0	0	0	0
115°	132	89	64	48	37	29	23	19	15	13	11	7	5	3	2	2	1	1	1	0	0	0	0	0
120	129	88	62	46	36	28	22	18	15	12	10	7	5	3	2	2	1	1	1	0	0	0	0	0
125	127	86	61	45	35	27	22	18	14	12	10	7	5	4	3	2	1	1	1	0	0	0	0	0
130	125	84	59	44	34	26	21	17	14	12	10	7	5	4	3	2	1	1	1	0	0	0	0	0
135°	122	82	58	43	33	26	21	17	14	12	10	7	5	4	3	2	1	1	1	0	0	0	0	0
140	119	80	56	42	32	25	20	17	14	12	10	8	6	4	3	2	1	1	1	0	0	0	0	0
145	116	77	55	41	32	25	21	17	15	13	11	9	6	4	3	2	1	1	1	0	0	0	0	0
150	112	75	54	40	32	26	21	18	16	15	13	10	8	6	4	3	2	1	1	0	0	0	0	0
152°	111	75	53	40	32	26	22	19	17	16	14	11	9	7	5	4	3	2	1	1	0	0	0	0
154	110	74	53	41	33	27	23	21	19	18	16	13	11	9	7	5	4	3	2	1	1	0	0	0
156	108	74	54	42	34	28	25	22	20	19	17	14	12	10	8	6	4	3	2	1	1	0	0	0
158	107	74	54	43	35	30	27	24	22	21	19	16	14	12	10	8	6	4	3	2	1	1	0	0
160	107	74	56	45	38	33	30	27	25	24	22	19	17	15	13	11	9	7	5	4	3	2	1	1
162°	107	76	59	48	42	38	35	32	30	28	26	23	21	19	17	15	13	11	9	7	5	4	3	2
164	109	79	63	54	48	42	39	36	34	32	30	27	25	23	21	19	17	15	13	11	9	7	5	4
166	113	86	71	54	48	42	39	36	34	32	30	27	25	23	21	19	17	15	13	11	9	7	5	4
168	122	98	78	60	48	38	32	27	23	19	17	12	9	7	5	4	3	2	1	1	0	0	0	0
170	143	100	73	55	43	34	28	23	19	16	14	10	7	5	3	2	2	1	1	0	0	0	0	0