PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Mid-Term Examination: Semester 2 | Academic Year: 2006

Date: December 21, 2006 | Time: 9:00-12:00

Subject: 226-332 Basic CAD/CAM | Room: R300

Instructions

- This is a closed book exam.
- Use of dictionary and calculator are allowed.
- There are 2 Parts and 13 problems in 10 pages.
- Answer all problems in these sheets.
- Total score is 60.
- Your answers could be in English or Thai.
- Please check all questions before start working.

Name:	Student ID.....

Problem	Full Score	Assigned Score
Part I	30	
Part II	30	
Total	**60**	

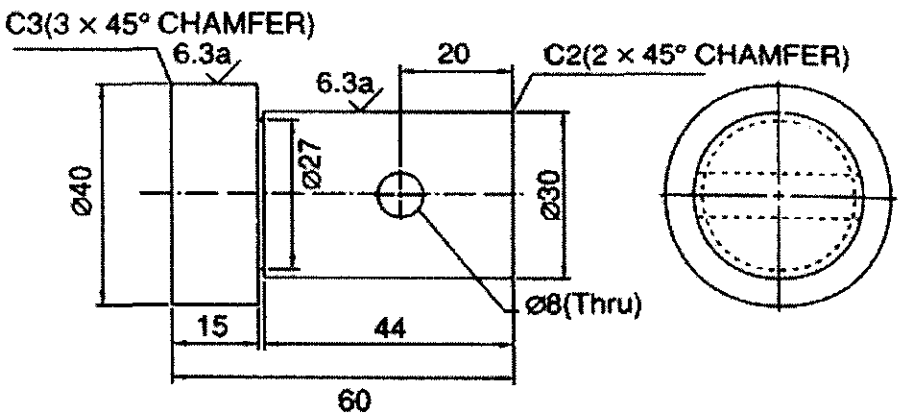
Asst. Prof. Dr. Thanate Ratanawilai

Mr.Srisit Chianrabutra

ทุจริตในการสอบโทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชา

Part I

Problem 1: For the part shown, develop its code using the Vuoso-Praha system. Assume that the material is plain steel. (5 points; Coding System)



Problem 2: Determine the most suitable machine tool for the job. (15 points; Selection of Machine Tools)

Suppose 800 units of a shaft are to be manufactured within 30 ± 0.05 mm. Suppose there are four alternative machine tools as follows:

Types of Machine Tools	Standard Deviation (mm)	Processing Cost per Unit ($/unit)	Processing time per Unit (min/unit)	Setup Time (min)
M/C #1	0.1750	7	1.25	10
M/C #2	0.0750	10	1.00	15
M/C #3	0.0125	12	0.95	20
M/C #4	0.0100	17	0.75	25

Unit Raw Material Cost = $12.00

Unit Salvage Value = $1.00

Process Average = 30.015 mm.

Note:

$SC = 1 - \Phi(Z^u) + \Phi(Z^l)$

$k^s = \frac{SC}{1 - SC}$

$k^i = 1 + k^s$

$Y^i = Y^o + Y^s$

$Y^s = k^s Y^o$

$Y^i = k^i Y^o$

$T = S + tY^i$

$X^o = k^i X^i - k^s X^s + k^i f(Yi)$

Problem 3: The Cool-Age Corporation Inc. (CACI) Manufactures a line of refrigerators. CACI wants to mechanize its painting shop, which currently employs 2 persons. The Management of CACI is planning to buy a robotic system, which is expected to cost the company $200,000 with an operating and maintenance cost of $2.50 per hour. At present the manual labor cost is $25 per hour per person including all benefits. Determine the payback period for this proposed investment in the robotic system. Is the investment justified? (10 points; Justification of Robots)

Part II

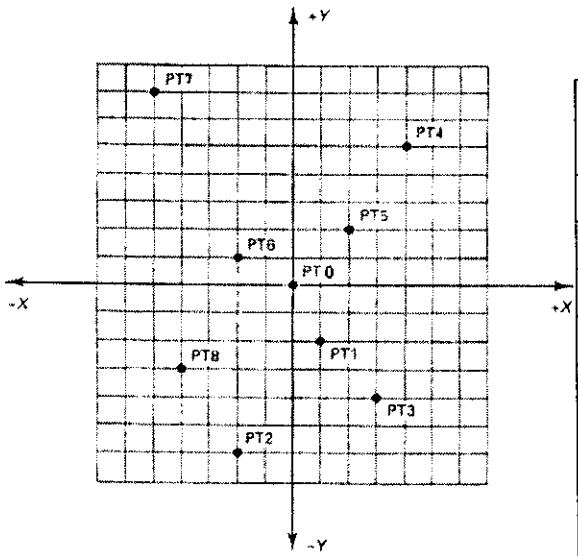
1. What improvements do CNC machines offer over traditional NC machine?

2. What is meant by the terms direct numerical control and distributive numerical control?

3. Name four requirements that must be satisfied prior to using CNC in a shop.

4. Explain the difference between an open loop system and a closed loop system.

5. Write the absolute and incremental X and Y coordinates of the points shown in Figure below.



Point	Absolute		Incremental	
	X	Y	X	Y
0	0	0	0	0
1				
2				
3				
4				
5				
6				
7				
8				

6. Explain an advantage and a disadvantage of using a collet-and-chuck holder as opposed to an end mill holder.

_____

_____

_____

_____

_____

7. Match the terms on the left with the definitions on the right:

___ Character	1. A letter describing the meaning of a number following the letter
___ Address	2. A sequence of blocks
___ Word	3. Alphanumeric or punctuation mark
___ Block	4. An address followed by a number
___ Program	5. A complete command to the CNC machine

8. What is the difference between modal and nonmodal G codes?

9. Match the terms on the left with the definitions on the right:

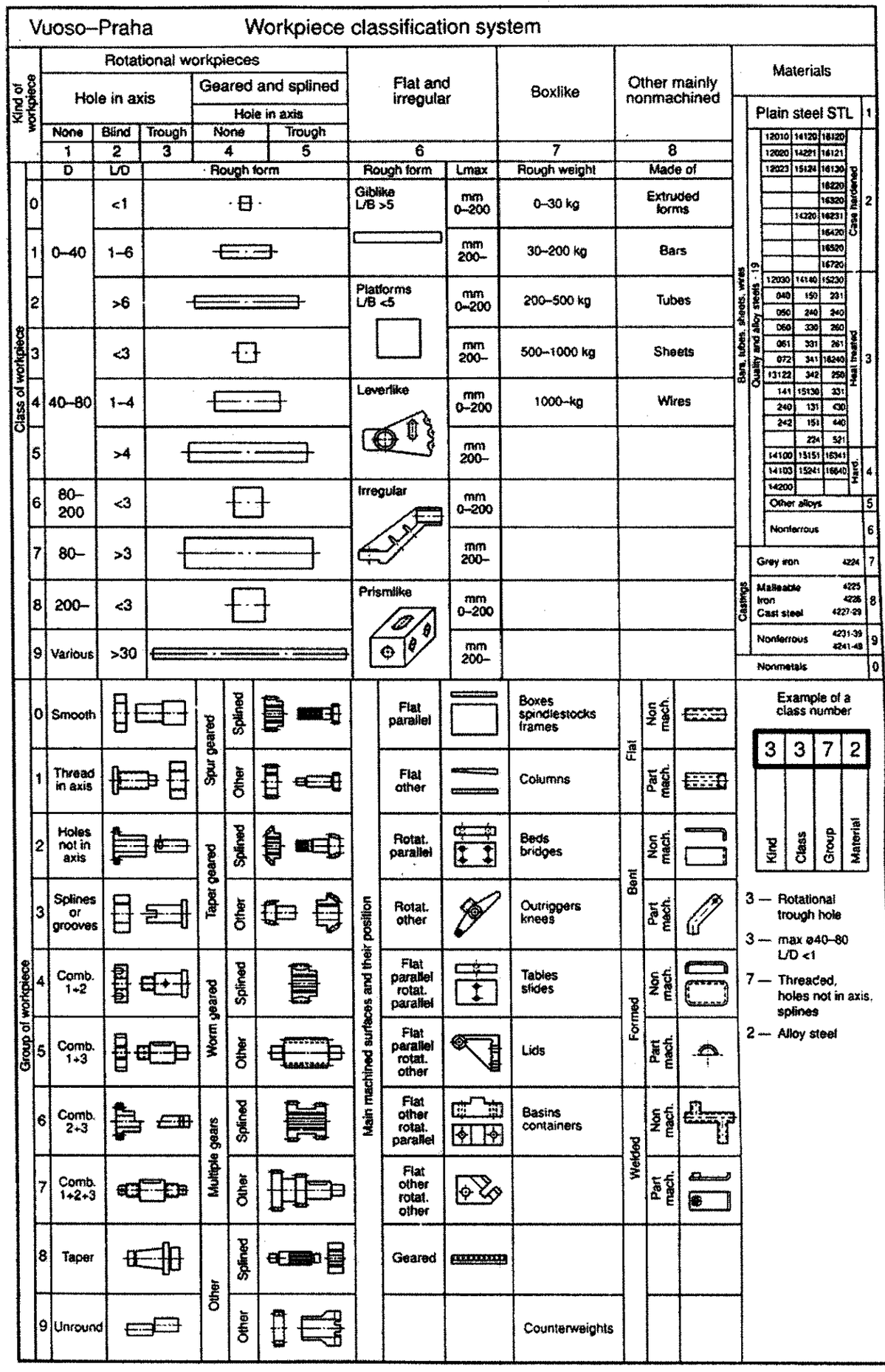
___ Chuck	1. Moves tool into work
___ Carriage	2. Supports right end of work
___ Turret	3. Clamps the work
___ Tailstock	4. Stores and execute CNC program
___ MUC	5. Provides a path for falling chips
___ Headstock	6. Machinery to rotate spindle
___ Slant bed	7. Hold cutting tool

10. Explain the significant of the following points:

(a) Reference point

(b) Machining origin

(c) Programming origin



Appendix A

Tail Area of Unit Normal Distribution

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859

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0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000