Name _____ ID _____ Seat No. _____

KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI

Final Examination

First semester, Academic Year 2009

TEN 132 Tool Drawing II — Tool Engineering (Bilingual)

Friday 2 October 2009 — Time : 13:00 – 16:00

Instructions :

1. This examination paper contains 6 problems 9 pages including this page. (total of 50 marks)
2. Closed book examination, books are not allowed.
3. Calculator and drawing instruments are allowed.
4. Table of 1 page is provided within the paper.

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Instructor

This examination paper has been evaluated from Tool and Materials Engineering Department

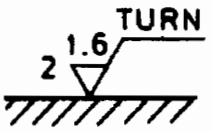
(Assoc.Prof.Dilok Sriprapai)

Head of Department

Name _____ ID _____ Seat No. _____

1. Explain the meaning of the following symbols; (6 Marks)

1.1



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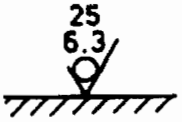
1.2



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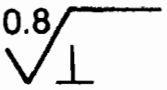
1.3



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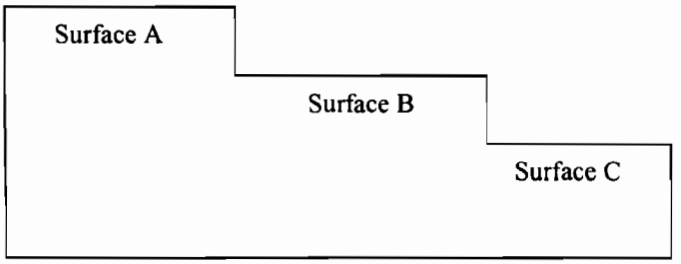
2. Apply surface roughness symbol to indicate the following surface (6 Marks)

Surface A – The surface can be prepared by any method with roughness value within a range of 0.6 to 3.2 μm.

Surface B – A machined surface (milling operation) roughness value of less than 3.2 μ with a circular relative to the center of surface direction.

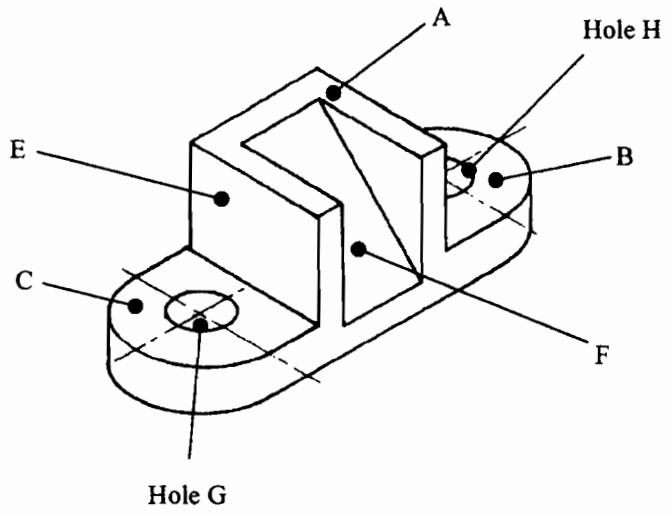
Surface C – remain as found from the last process and no material to be removed

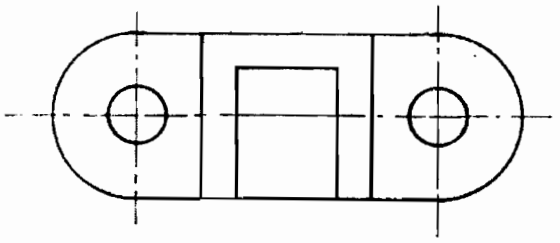


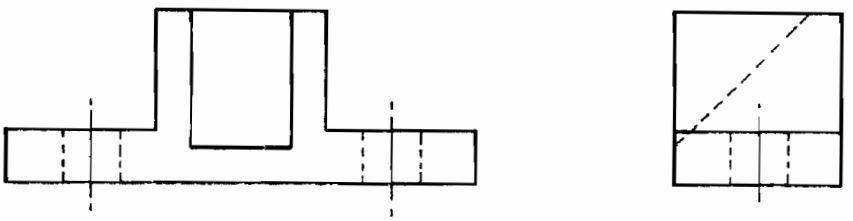
Name _____ ID _____ Seat No. _____

3. Apply geometry tolerance in the multi views drawing for the following cases;
   (a) Surface A is the datum and must be straight within 0.02 over its length.
   (b) Surfaces C and B are common datum feature and are to be parallel to datum A within 0.01 mm.
   (c) Surface F is to have an angularity tolerance of 0.15 mm with datum A.
   (d) The axis of holes G and H are perpendicular to surface C and B within 0.05 mm.

(10 marks)





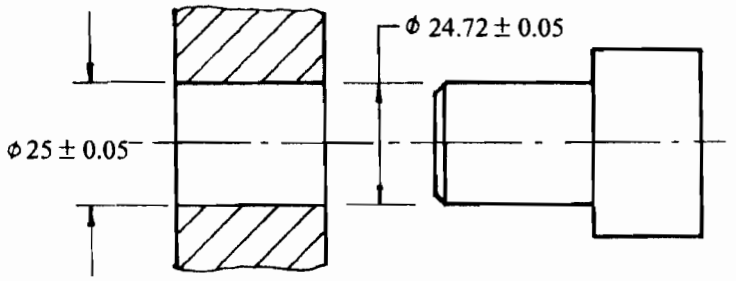


Name _____ ID _____ Seat No. _____

4. In the sketch, the pin must always fit into the hole with minimum clearance of 0.1

Apply the largest cylindricity tolerance equally to each part to comply with this condition.

4.1 Draw the symbol for geometry tolerance in the drawing (4 marks)

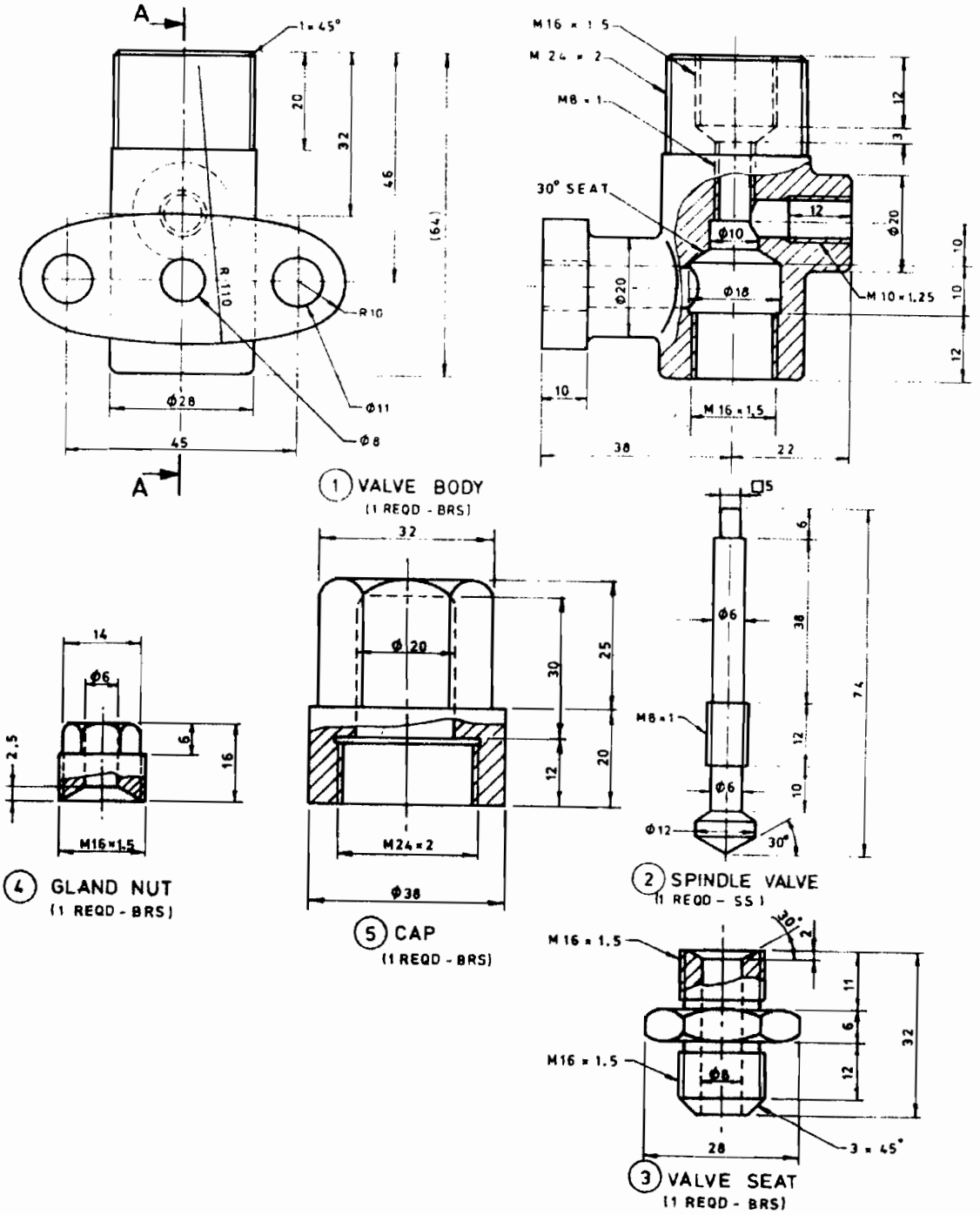


4.2 What is the maximum permissible combined error in cylindricity allowed if each part is toleranced on a maximum material condition basis? (2 marks)

Maximum cylindricity tolerance = _____ mm.

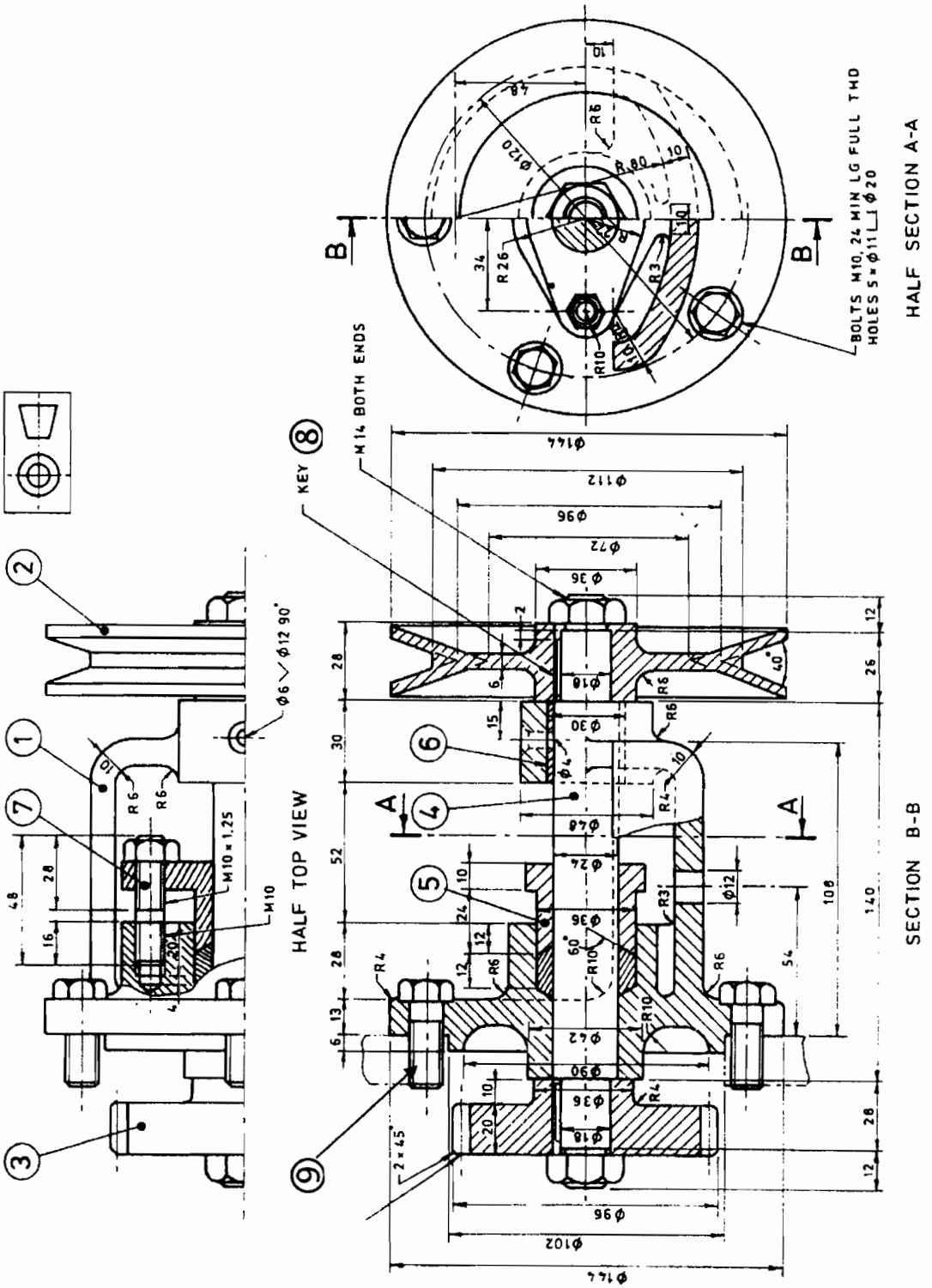
Name _____ ID _____ Seat No. _____

5. Details of components of a refrigerator valve are given. Sketch (not to scale) the general assembly views on a standard sheet (next page). Complete the title block and part lists block. (17 marks)



Name _____ ID _____ Seat No. _____

6. The detail assembly drawing of power transmission is given.



Name _____ ID _____ Seat No. _____

Answer the following questions (5 marks)

6.1 Complete the parts list block.

ITEM	DESCRIPTION	QTY	MATL
7		2	STL
6	BUSH	1	PH BRZ
5	GLAND	1	CI
4	SHAFT	1	STL
3		1	CI
2	VEE PULLEY	1	ALUM
1	BRACKET	1	CI

6.2 What is the proper size of key use in the key seat no.8 _____ mm x mm

6.3 What is the standard pitch of part number 9 _____ mm

Table

TABLE 1.8 ▶ Dimensions and tolerances for square parallel keyways

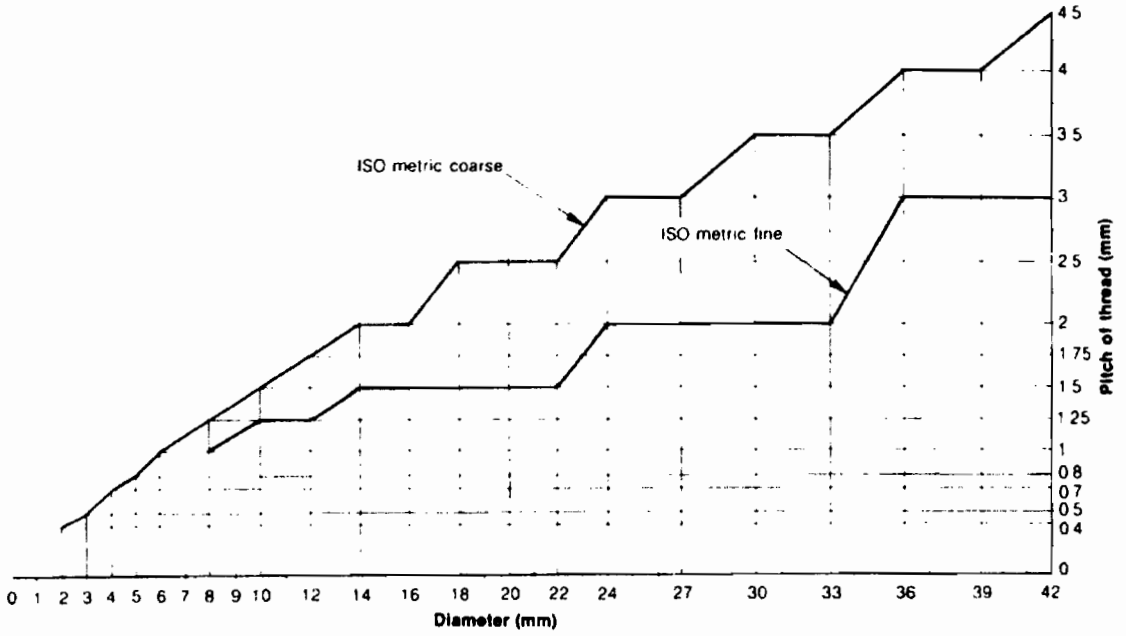
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SHAFT		KEY (see Note)	KEYWAY											
NOMINAL DIAMETER d (see Note)		SECTION b x h WIDTH x THICKNESS	WIDTH b						DEPTH				RADIUS r	
			TOLERANCE FOR CLASS OF FIT						SHAFT t_1		HUB t_2			
OVER	INCL.		NOM.	FREE		NORMAL		CLOSE AND INTERFERENCE	NOM.	TOL.	NOM.	TOL.	MAX.	MIN.
				SHAFT (H9)	HUB (D10)	SHAFT (N9)	HUB (Js9)*	SHAFT AND HUB (P9)						
6	8	2 x 2	2	+ 0.025	+0.060	–0.004	+0.012	0.006	1.2		1		0.16	0.08
8	10	3 x 3	3	0	+0.020	–0.029	–0.012	–0.031	1.8		1.4		0.16	0.08
10	12	4 x 4	4						2.5	+0.1 0	1.8	+0.1 0	0.16	0.08
12	17	5 x 5	5	+0.030 0	+0.078 +0.030	0 0.030	+0.015 0.015	-0.012 -0.042	3		2.3		0.25	0.16
17	22	6 x 6	6						3.5		2.8		0.25	0.16

Name _____ ID _____ Seat No. _____

TABLE 1.9 ▶ Dimensions and tolerances for rectangular parallel keyways

All dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SHAFT		**KEY** (see Note)	**KEYWAY**											
NOMINAL DIAMETER *d* (see Note)		**SECTION *b* x *h*** **WIDTH x THICKNESS**	**WIDTH *b***						**DEPTH**				**RADIUS *r***	
			TOLERANCE FOR CLASS OF FIT						**SHAFT t_1**		**HUB t_2**			
				FREE		**NORMAL**		**CLOSE AND INTERFERENCE**						
OVER	**INCL.**		**NOM.**	**SHAFT (H9)**	**HUB (D10)**	**SHAFT (N9)**	**HUB (J_S9)***	**SHAFT AND HUB (P9)**	**NOM.**	**TOL.**	**NOM.**	**TOL.**	**MAX.**	**MIN.**
22	30	8 x 7	8	+0.036	+0.098	0	+0.018	0.015	4		3.3		0.25	0.15
30	38	10 x 8	10	0	+0.040	−0.036	−0.018	0.051	5		3.3		0.40	0.25
38	44	12 x 8	12						5		3.3		0.40	0.25
44	50	14 x 9	14	+0.043	+0.120	0	+0.021	0.018	5.5		3.8		0.40	0.25
50	58	16 x 10	16	0	+0.050	0.043	−0.021	0.061	6	+0.2	4.3	+0.2	0.40	0.25
58	65	18 x 11	18						7	0	4.4	0	0.40	0.25
65	75	20 x 12	20						7.5		4.9		0.60	0.40
75	85	22 x 14	22	+0.052	+0.149	0	+0.026	−0.022	9		5.4		0.60	0.40
85	95	25 x 14	25	0	+0.065	−0.052	−0.026	−0.074	9		5.4		0.60	0.40
95	110	28 x 16	28						10		6.4		0.60	0.40
110	130	32 x 18	32						11		7.4		0.60	0.40
130	150	36 x 20	36						12		8.4		1.00	0.70
150	170	40 x 22	40	+0.062	+0.180	0	+0.031	0.076	13		9.4		1.00	0.70
170	200	45 x 25	45	0	+0.080	0.062	−0.031	0.088	15		10.4		1.00	0.70
200	230	50 x 28	50						17		11.4		1.00	0.70
230	260	56 x 32	56						20	+0.3	12.4	+0.3	1.60	1.20
260	290	63 x 32	63	+0.074	+0.220	0	+0.037	0.032	20	0	12.4	0	1.60	1.20
290	330	70 x 36	70	0	+0.100	0.074	−0.037	0.106	22		14.4		1.60	1.20
330	380	80 x 40	80						25		15.4		2.50	2.00
380	440	90 x 45	90	+0.087	+0.260	0	+0.043	0.037	28		17.4		2.50	2.00
440	500	100 x 50	100	0	+0.120	0.087	−0.043	0.124	31		19.5		2.50	2.00



Graphical comparison of metric thread