Name __________________________________  (1 point)

Section __________________________________

Engineering 28
Fall Semester 2004
Final Examination

*Read the instructions carefully and make sure you answer all parts of each question.*

*Print your full name on the top of every page, even if it is unused.*

Time Limit:  3 hours
Closed Book Exam

Problem 1 __________ /15
Problem 2 __________ /15
Problem 3 __________ /12
Problem 4 __________ /10
Problem 5 __________ /18
Problem 6 __________ /13
Problem 7 __________ /16

TOTAL EXAM SCORE ___________
Problem #1 (15 points)

The figure below shows the left and top views of a fixture, using third-angle projection.

a) Add to this figure a front view and a right side view, with hidden lines and centerlines, in the correct location with the correct scale, alignment, and orientation. It is not necessary to add dimensions to the views that you create.

b) Sketch a pictorial which shows the features seen in the top, front and right side views. It is not necessary to show the hidden lines on the pictorial.

Your sketches do not need to be made exactly to scale, but some reasonably proper proportions will be expected.
Problem 2 (15 points)

The figure below shows the front and top views of a clamp ring, using third-angle projection. It is desire to construct a section view of the part to reveal its interior detail. Note that a section line A-A has been placed on the front view.

a) Add to this figure a section view A-A in the place of a right side view. It is not necessary to add dimensions to the view that you create.

b) Sketch a pictorial of the sectioned object (i.e. how it would appear if it were actually cut along line A-A) which shows the features seen in the top, front and right side views. It is not necessary to show the hidden lines on the pictorial.

Your sketches do not need to be made exactly to scale, but some reasonably proper proportions will be expected.
Problem 3 (12 points)

Statements 1-12 refer to the figure below, which shows five views of points A, B, C, D, E, F and G. Some of the points are missing on the viewplanes. In addition the following information about these points are given:

Plane ABC is seen in true shape in viewplane H.
Line DE is perpendicular to plane ABC.
Point G is 10 mm below plane ABC.

Circle T for a true statement, circle F for a false statement.

T  F  1. Viewplane H is perpendicular to Viewplane F.
T  F  2. Viewplane 1 is perpendicular to Viewplane 2.
T  F  3. Viewplane 2 is perpendicular to Viewplane F.
T  F  4. Viewplane 1 is perpendicular to Viewplane F.
T  F  5. Viewplane 1 is perpendicular to Viewplane H.
T  F  6. Sufficient information is given to find Point A in all views.
T  F  7. Sufficient information is given to find Point B in all views.
T  F  8. Sufficient information is given to find Point C in all views.
T  F  9. Sufficient information is given to find Point D in all views.
T  F  10. Sufficient information is given to find Point E in all views.
T  F  11. Sufficient information is given to find Point F in all views.
T  F  12. Sufficient information is given to find Point G in all views.
Problem 4 (10 points)

The following terms are used by most solids modeling software in the course of creating either a part model or an assembly model. Define each term using one or two sentences, and explain how it is used in the course of creating a solid part or assembly model. Use descriptions that an ordinary layman would understand.

1. Parametric design
2. Feature based design
3. Sketch
4. Sketching plane
5. Dimensional constraints
6. Geometric constraints (e.g. Relations)
7. Associative constraints
8. Extruded solid
9. Extruded cut
10. Revolved solid
11. Revolved cut
12. Swept solid
13. Lofted solid
14. Reference plane
15. Model tree
16. Fillet
17. Chamfer
18. Draft
19. Shell
20. Mating constraints
Problem 4, con’t
Problem 5 (18 points)

Three rectangular solid primitives are shown below in the top, front, and right side views (using third angle projection). Based on the sequence of Boolean operations assigned, create an isometric sketch of each resulting composite solid on the following page. Be sure to show the intersections of the objects. Do not show the hidden lines.

a) \((A \cap B) + C\)  b) \((A + B) \cap C\)  c) \((A + B) - C\)

d) \((A \cap C) - B\)  e) \((A + C) \cap B\)  f) \((A - C) + B\)
Problem 5, con’t  Use of grid is optional.

(a)

(b)

(c)
Problem 5, con’t  Use of grid is optional.

(d) 

(e) 

(f)
Problem 6 (13 points)

The drawing shown below is the detail drawing of the hub for a disk drive spindle. On the next page, items on this drawing have been identified with arrows and numbers. Each item number refers to the information contained on the single text line or graphic at which the arrow points. Using terms that an ordinary layman would understand, explain what each item means.
Problem 6, con’t

1. 

2. 

3. 

4. 

5. 

6. 

7. 

8. 

9. 

10. 

11. 

12. 

13. 
Problem 7 (16 points)

The tooling block shown below consists of a rectangular block of steel into which 4 steel pins have been pressed. Each pin has a diameter of $6 \pm 0.010$ mm. The centers of the pins form a square with 100 mm sides. The pins can be located with an position accuracy of $\pm 0.030$ mm in any direction. The perpendicularity of the pins can be held to $0.015$ mm regardless of feature size. In order to achieve this accuracy, three orthogonal datum planes are needed on the tooling block, and each datum surface needs to be flat to within $0.005$ mm.

a) On the tooling block, show the size and position dimensions, and their tolerances, of the pins which will allow it to fit into the mating block (shown on the next page) without interference. Specify the necessary datum surfaces and their required conditions. Don’t forget to add centerlines.

The mate to the tooling block, shown on the next page, consists of a rectangular block of steel into which 4 holes have been drilled and reamed. Holes of this size can be drilled to an accuracy of $\pm 0.005$ mm on diameter, and $\pm 0.030$ mm on position in any direction. The holes can be held to a perpendicularity of $0.010$ mm regardless of feature size. Again, in order to achieve this accuracy, three orthogonal datum planes are needed on the mating block, and each datum surface needs to be flat to within $0.005$ mm. It is desired to drill and ream the smallest holes possible (all four are to be the same nominal size) in the mating block.

b) On the mating block shown on the next page, specify the size and position dimensions, and their tolerances, of the holes which will allow it to fit into the tooling block without interference. Specify the necessary datum surfaces and their required conditions. Don’t forget to add centerlines.

TOOLING BLOCK
Problem 7, con’t

MATING BLOCK