The University of Melbourne
Semester 1 Assessment, 2000

Department of Mechanical and Manufacturing Engineering

436-105 ENGINEERING COMMUNICATIONS

Student Number: ……………….

Examination duration: 3 hours
Reading time: 15 minutes
This paper has: 10 pages

Authorised materials:
Electronic calculators and drawing instruments may be used.

Instructions to invigilators:
Candidates are to complete the examination by writing and drawing in this examination paper, which must be collected at the end of the examination. No additional script books should be required.

Instructions to students:
Attempt all of the five questions. All questions are of equal value.
Space is provided in this paper to complete all the questions. No additional script books should be required. The whole paper must be left for collection by the invigilators at the end of the examination.

Be sure to write your student number in the space provided above.

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Question 1

Indicate whether the following statements are True or False by ticking the appropriate selection box.

T  F

☐ ☐ Technical sketching is only appropriate for fine detail work near the conclusion of the design process.

☐ ☐ Technical sketching is only appropriate for capturing simplified conceptions of the design very early in the design process.

☐ ☐ Ideation sketches are often done quickly in order to explore as many design ideas as possible.

☐ ☐ The width and depth axes of an isometric sketch are drawn 45° above the horizontal.

☐ ☐ A principal view in a sketch is always at right angles to the other principal views.

☐ ☐ The principal view is another name for the front view.

☐ ☐ An edge is only associated with one face in a solid object.

☐ ☐ A face is joined to other faces via edges.

☐ ☐ Perspective projection creates a more realistic image of an object than parallel projection.

☐ ☐ A perspective pictorial drawing is less realistic but easier to draw than an isometric pictorial.

☐ ☐ Parallel projection can only be used with objects with parallel edges.

☐ ☐ A multiview and axonometric pictorial both use parallel projection.

☐ ☐ Orienting a face and the projection plane so that they are parallel creates an edge view of the face.

☐ ☐ In a valid wireframe model, each face must contain at least three vertices and form a closed loop.

☐ ☐ One problem with wireframe models is ambiguity.

☐ ☐ Four points are needed to define a Bezier curve.

☐ ☐ A Boolean difference operation is sensitive to which solid is placed first in the equation.

☐ ☐ The Boolean intersection of two solids which do not overlap creates a null object.

☐ ☐ When laying out orthographic views, it is the usual practice to consider the frontal plane as lying in the plane of the paper, and the horizontal and profile planes as being rotated into the frontal plane.

☐ ☐ Perspective projection is sometimes substituted for parallel projection in a multiview projection.

☐ ☐ The top view is always vertically above the front view, but the side view may not always be horizontally in line with the front view.

☐ ☐ The right side view is created using a profile plane of projection.
The front of the object in both the top and side views faces the front view.

There are only three principal views of an object.

First-angle projection is the multiview projection convention used in Australia.

Ordinarily, in selecting the front view, the object is placed to obtain the smallest number of hidden surfaces.

In making an orthographic multiview drawing, one view should be completed before starting the others.

The alphabet of lines is specified by Australian standards.

Points of tangency between surfaces are represented with centre-lines in a multiview drawing.

A fillet is a rounded interior corner.

In making any orthographic multiview drawing, true projection is never violated.

An isometric drawing of an object is slightly larger than the isometric projection.

Hidden lines should be omitted on an isometric drawing, unless absolutely necessary for clarity.

The angles of an inclined line in an orthographic view can be transferred directly to an isometric drawing.

An oblique drawing is drawn with features in two of the dimensions in true size and shape.

A cabinet oblique view is drawn true length along the receding axis.

An auxiliary view of an inclined surface is not one of the principal views.

A tertiary auxiliary view is used to show the true size and shape of an oblique surface.

An auxiliary view of an inclined surface is generated by defining a line of sight perpendicular to its normal view.

An auxiliary view of an inclined surface is generated by defining a line of sight perpendicular to its edge view.

An oblique line will appear foreshortened in all three principal projection planes.

A true length line will be perpendicular to the edge view of the projection plane in the adjacent views.

If a line in a plane appears as a point, the plane appears in its true size and shape.

Two parallel lines can be used to define a plane.

To measure the angle between two planes, you require a view in which both planes are on edge.

An intersection of two planes is a straight line.

An intersection of a plane and a solid is a plane.

A cylinder is best developed using the parallel line method.
A cylinder is developed using approximate development.

In any sectional view, it is considered good practice to omit all hidden surfaces unless such surfaces are necessary to clarify the representation of the object.

For an offset section, it is common practice to use visible lines in the section view to show the bends in the cutting plane.

Thin features, such as webs, are left unsectioned when cut parallel to the feature by the cutting plane.

A half section is used when a view is needed showing both the exterior and interior constructions of a symmetrical object.

A revolved section is a section which has been rotated $90^\circ$ and placed adjacent to the orthographic view.

A detail drawing is a complete set of standardised drawings specifying the manufacturing and assembly of a product.

An assembly drawing shows how a group of parts in a design go together.

In an assembly drawing, standard parts such as fasteners bushings, bearings, etc. are not drawn as details.

**Question 2**

Figure 1 shows top and front views of a schematic representation of a material handling robot (similar to the one illustrated in the photograph below). The ‘upper arm’ BC can rotate about a horizontal ‘shoulder axis (angle $\theta_1$); similarly the ‘forearm’ CD and ‘hand’ DE can rotate about horizontal ‘elbow’ and ‘wrist’ axes (angles $\theta_2$ and $\theta_3$), respectively.

The robot is carrying a rectangular box. It is required that the robot rotate the box through $90^\circ$ and place it in the final position shown. During this movement, the box remains perpendicular to the hand DE.

By graphical construction, **draw** the position of the robot arm in both views when the box is in its final position, and **determine** the angles $\theta_1$ and $\theta_2$ turned through by the upper arm and forearm.

*Hint: Constructing a primary auxiliary view on the auxiliary vertical plane should be very helpful!*
Figure 1
Question 3

(a) For each of the ten objects shown in figure 2 indicate, by ticking, which of the four alternatives is a correct representation of the view indicated by the arrow.

Figure 2

Question 3 continued on next page ...
(b) Two views of a multiview drawing of an object are given in figure 3. **Draw** the missing view and **make** an isometric sketch of the object.
Question 4

Complete the front view in figure 4, showing the line of intersection between the objects.

Figure 4
Question 5

An isometric view of a cast iron ‘frame guide’ is shown in figure 5.

Make a fully-dimensioned, multiview detail drawing of the frame guide on page 10, where a convenient layout of views is suggested. Provide a title block and appropriate information about the part and the drawing.

Figure 5