Candidate Instructions

1. You **MUST** make sure that your responses to the questions in this examination paper will show your achievement in the criteria being assessed.

2. There are **THREE** sections to this paper.

3. You must answer **SIX** questions.
   - **ALL FOUR** questions from Section A
   - **ONE** question from Section B
   - **ONE** question from Section C

4. Answer each question on the drawing paper provided.
   You are required to use correct linework and presentation, and are encouraged to include freehand sketches, where necessary, to show the development of ideas in the solution of problems. Construction must be shown.

5. All dimensions are in millimetres unless otherwise stated.

6. All written responses must be in English.

On the basis of your performance in this examination, the examiners will provide results on each of the following criteria taken from the course statement:

**Criterion 2**  Apply geometric knowledge and skills in interpreting and transferring drawings.

**Criterion 3**  Solve geometric problems.

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Answer **ALL** questions in this section on the drawing paper provided.

**Question 1** – This question assesses **Criterion 2**.

A staircase has to be built from the floor to the landing. Six (6) steps (excluding the landing and floor) of equal height are to be built.

Redraw the elevation to a scale of 1:20 and position each step showing all construction.

![Figure 1](image_url)

Figure 1.
**Question 2** – This question assesses **Criterion 3**.

Point P is stable and unmoved. Four (4) forces are known to be acting on P.

Find the fifth unknown force that keeps P stable.

![Diagram of forces acting on point P](image)

**Figure 2.**

**Section A (continued)**

**Question 3** – This question assesses **Criteria 2 and 3 equally**.
Figure 3. shows a circular disc with a flat part. A cord is fixed at B and is unwound taut anticlockwise from A.

Construct the locus of A as it is unwound.

Figure 3.

Question 4 – This question assesses Criteria 2 and 3 equally.
Figure 4. shows the directrix D, D1 and two points P and Q on the curve of a parabola.

Locate the focus of the parabola and draw the portion of the curve that passes through the points P and Q.
SECTION B

Answer **ONE** question from this section on the drawing paper provided.

This section assesses **Criteria 2 and 3 weighted 1:4 respectively.**

**Question 5**

Plot the locus of point P.

Points A and B are fixed and AEF is a rigid link that rotates about A.

<table>
<thead>
<tr>
<th>DE</th>
<th>AE</th>
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<tbody>
<tr>
<td>60</td>
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<td>GP</td>
<td>BG</td>
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<td>37</td>
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</tbody>
</table>

Figure 5.
Question 6

Figure 6. shows the plan and elevation of a small shack.

Draw a view of the shack from the direction of the SW arrow and downwards from an angle of elevation of 30 degrees.

Figure 6.

Section B (continued)
Question 7

A welded steel hopper with attached chute is designed to be bolted to a flat vertical wall.

(a) Draw a top and front view of the hopper (do not show dimensions).

(b) Determine the true lengths of edges DH, BF, GL and EJ.

(c) Draw the true shape of surfaces ABFE and BCGF.

Figure 7.
Answer ONE question from this section.

This section assesses Criteria 2 and 3 weighted 4:1 respectively.

Question 8

The nose cone of a supersonic aircraft is constructed by winding carbon fibre over a conical mould, saturating it with epoxy resin and baking it.

Figure 8. represents the winding process. The fibre dispenser moves along a track parallel to the cone axis and the fibre wraps around the cone.

The cone rotates twice whilst the dispenser travels from the base to the apex.

Draw the top and end views of the cone showing the location of one fibre.

![Figure 8.](image)

Section C continues.
Question 9

A regular pentagonal right pyramid has a side of base 40 and an altitude of 80. It rests with one of its triangular faces on the horizontal plane as shown in Figure 9.

Also shown are projections of a square prism of side 25 which penetrates the pyramid.

Draw the plan and elevation of the solids showing all lines of interpenetration.

Figure 9.
Question 10

The coordinates of two adjoining triangular laminae ABC and ABD are given in tabular form. Note: A lamina is a thin, flat, limited plane of any shape.

<table>
<thead>
<tr>
<th></th>
<th>x</th>
<th>y</th>
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<tr>
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</tr>
<tr>
<td>B</td>
<td>68</td>
<td>10</td>
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<td>C</td>
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</tr>
<tr>
<td>D</td>
<td>63</td>
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</tr>
</tbody>
</table>

Choose a suitable scale to:

(a) Plot these points in third angle orthographic projection and draw the laminae in the plan and elevation.

(b) From these views project an end elevation.

(c) Find the dihedral angle between the laminae.

![Figure 10](image-url)