Leaving Certificate Examination 2004

Technical Drawing

Paper II(A) – Higher Level
(Engineering Applications)
(200 Marks)

Friday 18 June
Afternoon, 2.00 – 5.00

Instructions
(a) Ensure that you have received examination paper M84(L) which accompanies this paper.
(b) Answer any four questions. All questions carry equal marks.
(c) Drawings and sketches should be in pencil unless otherwise stated.
(d) Where dimensions are omitted they may be estimated.
(e) Credit will be given for neat orderly presentation of work.
(f) Work on one side of the paper only.
(g) The Examination Number should be written on each drawing sheet used.
(h) First or third angle projection may be used.

NOTE: All drawings are shown on examination paper M.84(L) which accompanies this paper.
1. Details of an Adjustable Pulley are given in Fig. 1 with a parts list tabulated below.

(a) Draw a full size sectional elevation A-A showing the parts fully assembled.
(b) Add the title ADJUSTABLE PULLEY and insert item reference numbers to identify the parts.
(c) Using a neat freehand sketch, suggest a basic design modification that will provide lubrication between part 5 and part 8.

<table>
<thead>
<tr>
<th>PART</th>
<th>NAME</th>
<th>REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BRACKET</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>PULLEY</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>ADJUSTING SCREW</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>SPACER</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>PLAIN BEARING</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>M24 NUT</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>M24 WASHER</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>SHAFT</td>
<td>1</td>
</tr>
</tbody>
</table>

2. (a) Draw the profile and displacement diagram for a plate cam rotating in a clockwise direction and imparting the following motion to an in-line roller follower of 20mm diameter:

- $0^\circ$ to $90^\circ$: Dwell.
- $90^\circ$ to $270^\circ$: Rise 42mm with uniform acceleration and retardation.
- $270^\circ$ to $360^\circ$: Fall 42mm with simple harmonic motion.

The nearest approach of the roller centre to the camshaft centre is 45mm. The camshaft diameter is 20mm.

(b) In the mechanism shown in Fig. 2 the cranks AB and CD are connected by two gears, so that CD rotates at twice the angular speed of AB and in the opposite direction. The piston F is constrained to move vertically and the cranks are in their initial starting position.

(i) Draw, full size, the mechanism shown, and plot the locus of point E for one complete revolution of AB.

(ii) Measure and dimension on your drawing the length of stroke of piston F.

3. The elevation and plan of a sheetmetal transition piece are shown in Fig. 3.

(a) Draw the given views and produce a one-piece surface development of the transition piece with the seam at S-S.

(b) Make neat freehand sketches of two different types of joint which would be suitable for the seam S-S. Name each joint.
4. The elevation and plan of a gearbox cover are given in Fig. 4. A pictorial sketch of the unit is also shown.

(a) Draw the following views *(Hidden detail is not required)*:

(i) A sectional plan on A-A;
(ii) A sectional elevation on B-B.
(iii) An end elevation viewed in the direction of arrow C.

(b) Insert the following on the drawing:

(i) Four leading dimensions;
(ii) The appropriate ISO projection symbol;
(iii) Title: GEARBOX COVER;

5. (a) Fig. 5(a) shows the layout of an electric motor and water pump. Sketch freehand, in good proportion, *a sectional elevation* through a flanged coupling which would be suitable for connecting the two coaxial shafts. Your sketch should indicate clearly how the coupling is secured to the shafts.

(b) Fig. 5(b) shows three views of a platform bracket.

Draw a full size isometric view of the bracket with the corner marked X as the lowest point. *(Hidden detail is not required).*

(c) Sketch freehand each of the following pipe fittings:

(i) 90° Elbow;
(ii) Tee Junction;
(iii) Cross.

6. Answer SECTION A or SECTION B but not both

**SECTION A**

(a) An incomplete sectional elevation of a bevel gear is shown in Fig. 6(a). Draw the complete sectional elevation of the gear using the following information:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch circle diameter</td>
<td>200mm</td>
</tr>
<tr>
<td>Tooth face width</td>
<td>65mm</td>
</tr>
<tr>
<td>Addendum</td>
<td>10mm</td>
</tr>
<tr>
<td>Dedendum</td>
<td>12.5mm</td>
</tr>
<tr>
<td>Hub diameter</td>
<td>80mm</td>
</tr>
<tr>
<td>Bore diameter</td>
<td>40mm</td>
</tr>
<tr>
<td>Fillets</td>
<td>3mm</td>
</tr>
</tbody>
</table>

(b) An involute gear wheel with 24 teeth, 20° pressure angle and module 10 is in mesh with a rack. Draw, full size, the gear and rack in mesh, showing two teeth on the gear and three teeth on the rack.

Tabulate on the sheet the following values for the gear wheel:

Addendum, Dedendum, Pitch circle diameter, Base circle diameter, Circular pitch and Tooth thickness.
OR

SECTION B

(a) Briefly answer any six of the following questions. (Sketches should be used where appropriate)

(i) List two types of hardware upgrades that would enhance a CAD system;
(ii) List three types of plotters/printers suitable for plotting CAD drawings;
(iii) What is the difference between a Text Font and a Text Style;
(iv) Sketch an example of Baseline dimensioning;
(v) List three ZOOM commands;
(vi) Explain what is meant by the term ‘Menu Customisation’;
(vii) Sketch the following CAD Linetypes: ZIGZAG, PHANTOM, DOT;
(viii) Explain the purpose of a ‘Hyperlink’ in an on-line CAD drawing;

(b) With reference to CAD, and using freehand sketches, where appropriate, explain the difference between the following pairs of terms:

(i) Line and Polyline;
(ii) Linear Dimension and Aligned Dimension;
(iii) Revolved Surface and Ruled Surface;
(iv) Paperspace and Modelspace;
(v) Torus and Dome.

(c) With the aid of sketches and using the two overlapping solids shown in Fig. 6(b) as an example, explain the following solid modelling operations:

(i) Subtraction (ii) Union (iii) Intersection.

(d) Draw, full size, the object that would be displayed on a CAD system when the following commands are executed. All points (X,Y) are specified using absolute co-ordinates. The origin (0,0) is located at the lower left corner of the display.

• Sheet size is set. Lower left corner (0,0) and (210,148) upper right corner.
• The following lines are drawn: AB, BC, CD and DE, using the following coordinates:
  A (100,30), B (30,30), C (30,50), D (60,70), E (60,90)
  The four lines are selected and mirrored about a mirror line. The first point on the mirror line is at (100,30) and the second point is at (100,90). The old object is not deleted.
  A 3-point arc is drawn. Start point (60,90), second point (100,130) and end point (140,90).
  A polygon is drawn. Number of sides 6, centre of the polygon (100,90), circumscribed about a circle of radius of 25mm.
• A circle with a 10mm diameter is drawn with its centre at point (70,45). The circle is copied using a rectangular array with 1 row, 4 columns and a distance of 20mm between columns.
Scrúdú Ardteistiméireachta 2004
Leaving Certificate Examination 2004

Líníocht Theicniúil
Technical Drawing

Páipéar II(A) – Ardleibhéal
Paper II(A) – Higher Level

(Feidhmiúcháin Innealtóireachta)
(Engineering Applications)

Dé hAoine 18 Meitheamh, Tráthnóna, 2.00 - 5.00
Friday 18 June, Afternoon, 2.00 - 5.00

NÓTA: Deimhnigh go bhfuair tú scrúdpháipéar M.84, a ghabhann leis an bpáipéar seo.
NOTE: Ensure that you have received examination paper M.84 which accompanies this paper.
Fig. 2 / Fíor 2

Fig. 3 / Fíor 3

\[ AB = 38 \]
\[ CD = 18 \]
\[ BE = DE = EF = 100 \]
Fig. 4 / Fior 4

Fillet: R3
Filleid: R3
Fig. 6(a) / Fíor 6(a)

Fig. 6(b) / Fíor 6(b)