



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2007

Technical Drawing
Paper II(A) – Higher Level
(Engineering Applications)

(200 Marks)

Friday 15 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 M84(L) which accompanies this paper.**

1. Details of a Belt Tensioning Unit are given in Fig. 1 with the parts list tabulated below.
- (a) Draw a full size sectional elevation A-A showing the parts fully assembled.
 - (b) Insert item reference numbers to identify the parts and add the title: BELT TENSIONING UNIT.
 - (c) Using a neat freehand sketch suggest a basic design modification that will allow lubricant to be applied between part 4 and part 7.

PART	NAME	REQUIRED
1	BODY	1
2	PULLEY	1
3	M10 SCREW	1
4	BUSH	2
5	M24 NUT	1
6	M24 WASHER	1
7	ECCENTRIC SHAFT	1

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

$\frac{1}{6}$ second rise 40mm with simple harmonic motion;
 $\frac{1}{3}$ second dwell;
 $\frac{1}{3}$ second fall 40mm with uniform acceleration and retardation;
 $\frac{1}{6}$ second dwell.

The nearest approach of the roller centre to the camshaft centre is 45mm.
The camshaft diameter is 25mm.

- (b) In the mechanism shown in Fig. 2, the crank OA rotates clockwise about the fixed point O at a constant speed. The rod AB connects to the link CE by a pin joint at B. During one revolution of OA the end C of the link CE slides from C to D and back to C again.

Draw, full size, the mechanism in its given starting position, and plot the locus of point E during one complete revolution of crank OA.

3. The elevation and plan of a sheet metal transition piece, which is connected to a circular duct, are shown in Fig. 3.
- (a) Draw, to a scale of 1:10, the given views and produce a one-piece surface development of the transition piece with the seam at S-S.
 - (b) State the minimum size of rectangular sheet that will contain the development.
 - (c) Make neat freehand sketches of:
 - (i) A sheet metal joint which would be suitable for the seam S-S;
 - (ii) A safe edge suitable for the open bottom of the transition piece;
 - (iii) A sheet metal joint which would be suitable for connecting the transition piece to the circular duct.
- Include the title of the sheet metal joint/edge below each sketch.***
4. (a) The projections of a v-block clamp are shown in Fig. 4.
Make an exploded isometric drawing of the v-block. The drawing should show clearly how the parts labelled 1, 2 and 3 are assembled.
Make corner X the lowest point on your drawing. Hidden detail is not required.
- (b) Make a neat freehand sketch of a typical universal joint.
5. The elevation and plan of a pump housing are given in Fig. 5.
A pictorial sketch of the housing is also shown.
- (a) Draw the following views (*Hidden detail is not required*):
 - (i) A sectional elevation on A-A;
 - (ii) A sectional plan 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: PUMP HOUSING.

6. Answer SECTION A or SECTION B but not both.

SECTION A

- (a)** Draw, full size, **two** involute teeth of a gear wheel with 24 teeth, module 10 and a pressure angle of 20° .

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

- Addendum
- Pitch Circle Diameter
- Tooth Thickness
- Dedendum
- Circular Pitch
- Base Circle Diameter

- (b)** A sectional elevation of a universal cylinder, with the piston rod in the fully retracted position, is shown in Fig. 6(a).
- (i) Make a large neat freehand sectional sketch of the assembly showing the piston rod in the fully extended position.
- (ii) Identify and neatly label on the sketch the following five parts: Piston, Cylinder, Rod seal, Piston seal, and Cylinder seal.

OR

SECTION B

- (a) **Briefly** answer any **six** of the following questions.
(*Sketches should be used where appropriate*)
- (i) State **four** advantages that CAD offers over traditional drawing methods;
 - (ii) Identify **two** specific input devices and **two** specific output devices in a CAD system;
 - (iii) State **two** potential problems which should be considered when downloading CAD files from the Internet;
 - (iv) Name two settings that would typically be included in a template drawing;
 - (v) Using a sketch, show how layers may be used in a CAD drawing;
 - (vi) Sketch an example of *Baseline* dimensioning;
 - (vii) Explain the term *Aliasing* on a CAD display;
 - (viii) Explain what is meant by the term '*Parametric CAD System*'.
- (b) Name a CAD package that could be used to produce the 3D solid model of the component shown in Fig. 6(b). Using sketches, where appropriate, briefly outline the various steps involved and the commands used in generating the CAD model.
- (c) With reference to CAD, and using freehand sketches where appropriate, explain the difference between the following pairs of terms:
- (i) ***Extend*** and ***Lengthen***;
 - (ii) ***Lineweight*** and ***Linetype***;
 - (iii) ***Pan*** and ***Zoom***;
 - (iv) ***Wireframe model*** and ***Surface model***;
 - (v) ***Viewpoint*** and ***Viewport***.
- (d) Draw, full size, the object that would be displayed on a CAD system when the following commands are executed. The origin (0,0) is located at the lower left corner of the display.
- Sheet size is set. Lower left corner (0,0) and upper right corner (297,210).
 - A semi ellipse is drawn with a major axis start point of (40,90) and a major axis end point of (260,90). The minor axis is 140mm long and the semi ellipse passes through the point (150,160) on the minor axis.
 - Two circles are drawn as follows:
Circle 1: centre (220,90), radius 15 Circle 2: centre (250,90), radius 5
 - Circle 2 is selected and subjected to a polar (circular) array. The centre point of the array is (220,90) and the fill angle is 270° , measured in an anticlockwise direction. The total number of items in the array is 3.
 - Two lines AB and BC are drawn using the following absolute coordinates:
A (40,90) B (50,80) C (60,90)
 - The lines AB and BC are subject to a rectangular array with one row, five columns and with a distance of 20 between the columns.
 - A 3-point arc is drawn. Start point (180,90), second point (220,50) and end point (260,90).
 - A line is drawn, starting at the point (140,90) and ending at the point defined by the relative polar coordinates (@40<0). The intersection between the line and the arc is filleted using a radius of 10.
 - The text 'LOCKING PLATE' is inserted. The text is centre justified, with a centre point of text (150,20), a text height of 5mm and a text rotation angle of 0° .

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