



Coimisiún na Scrúduithe Stáit
State Examinations Commission

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.

PART	NAME	REQUIRED
1	BRACKET	1
2	PULLEY	1
3	ADJUSTING SCREW	1
4	SPACER	1
5	PLAIN BEARING	1
6	M24 NUT	1
7	M24 WASHER	1
8	SHAFT	1

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° to 90°	Dwell.
90° to 270°	Rise 42mm with uniform acceleration and retardation.
270° to 360°	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:
- | | |
|-----------------------|--------|
| Pitch circle diameter | 200mm |
| Tooth face width | 65mm |
| Addendum | 10mm |
| Dedendum | 12.5mm |
| Hub diameter | 80mm |
| Bore diameter | 40mm |
| Fillets | 3mm |
- (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.

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