INSTRUCTIONS

(a) Answer <u>four</u> questions.
(b) All questions carry equal marks.
(c) Construction lines must be shown on all solutions.
(d) Write the number of the question distinctly on the answer paper.
(e) <u>All dimensions on the question paper are given in millimetres</u>.
(f) First or third angle projection may be used.
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1. Fig. 1 shows the elevation and plan of a shaped solid.

   (a) Draw the given views and project an auxiliary elevation on X_1 Y_1.

   (b) From the auxiliary elevation project a second plan on X_2 Y_2.

                                                          Scale 1 : 1

2. (a) Construct a diagonal scale of 4 : 1 which will read up to 40 mm and show tenths
        of a millimetre.

   (b) Using the diagonal scale for all measurements construct the quadrilateral ABCD
        shown in Fig. 2 given that point C is equidistant from A, B and D.   Show
        the length CD on the scale and write down its length.

   (c) Draw a rectangle on the base BE which will have the same area as quadrilateral
        ABCD.

3. (a) Fig. 3 shows the projections of a solid and an oblique plane VTH.
        Complete the plan and elevation of the solid when it is cut by the
        oblique plane VTH.

   (b) Determine the traces of an oblique plane which shall be inclined at 50° to
        the Vertical Plane and at 60° to the Horizontal Plane.

                                                          Scale 1 : 1

4. A shaped piece of thin metal is shown in Fig. 4.

   (a) Draw a development of the metal in one piece.

   (b) Ignoring the thickness of the metal draw an elevation, end view and plan of the
        metal in its given shape.

                                                          Scale 1 : 1

5. Fig. 5 shows the projections of two solids which penetrate each other.
   Draw the plan and complete the elevation of the solids showing clearly all lines
   of interpenetration.

                                                          Scale 1 : 1

6. (a) Construct two conic curves which will have eccentricities of $\frac{2}{3}$ and $\frac{5}{4}$ respectively
        and a distance of 46 mm from the focus to the directrix in each case.   Name
        the curves.

   (b) In Fig. 6 lines AB and BC are tangents to a parabola.   The position of the
        focus F is also given.
        Determine the vertex and axis of the parabola and draw the curve showing
        clearly the tangency points.

                                                          Scale 1 : 1

7. (a) A plate cam operates an in-line knife edge follower and rotates
        anti-clockwise at 10 revolutions per minute.   The nearest approach of the
        follower to the cam centre is to be 40 mm and the cam shaft diameter is
        32 mm.
        Set out the profile of the cam to give the following motion.
        Lift 40 mm with simple harmonic motion in 1.5 secs
        Dwell for 1 second
        Fall 24 mm with uniform velocity in 1.25 secs
        Fall 16 mm with simple harmonic motion in 1.5 secs
        Dwell for remainder of the revolution.

   (b) Use a separate diagram to show the change in the cam profile if the line of
        action of the follower is offset 20 mm to the right.

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LÍNÍOCHT TEICNIÚIL — 1
TECHNICAL DRAWING — 1

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