Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2005

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

Friday 17 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 a Roller Support 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, with the roller bracket in its lowest position.

   (b) Insert item reference numbers to identify the parts and add the title ROLLER SUPPORT.

   (c) With the aid of a neat freehand sketch suggest a modification to the design, which will ensure that the screwed spindle (part 2) cannot be inadvertently screwed out of the support base (part 1).

PART	NAME	REQUIRED
1	SUPPORT BASE	1
2	SCREWED SPINDLE	1
3	ADJUSTING NUT	1
4	SUPPORT ROLLER	1
5	TOMMY BAR	2
6	SUPPORT CLAMP	1
7	ROLLER BRACKET	1
8	M12 NUT	1
9	M12 WASHER	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:

   0^0 to 120^0 rise 20mm with uniform acceleration and retardation;

   120^0 to 150^0 dwell;

   150^0 to 330^0 rise 40mm with simple harmonic motion;

   330^0 to 360^0 fall 60mm with uniform velocity.

   The nearest approach of the roller centre to the camshaft centre is 35mm.
   The camshaft diameter is 20mm.

   (b) In the mechanism shown in Fig. 2 the crank OA rotates at a constant speed in a clockwise direction about the fixed point O. The link AC is attached to the crank CD which oscillates about the fixed centre D. The link BE is connected to AC by a pin joint at B. The piston E is constrained to move horizontally.

      (i) Draw, full size, the mechanism shown and plot the locus of point B during one complete revolution of crank OA.

      (ii) Measure and dimension on your drawing the length of stroke of piston E and the angle of movement of DC.

3. The elevation and plan of a sheet metal hopper which is penetrated by a cylindrical pipe are shown in Fig. 3.

    (a)   Draw the given plan and complete the elevation showing the intersection curve.

    (b)   Draw a one-piece surface development of the hopper with the seam at S-S.

    (c)   Draw the true shape of the top opening of the hopper.

4. The plan and elevation of a valve housing are shown in Fig. 4.
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;
        (i)   Title: VALVE HOUSING.

5.   **(a)**   A sectioned pictorial view of a multivalve car engine is shown in Fig. 5(a).
        The following parts are identified with item references 1 to 10:

        Timing belt, Crankshaft, Oil sump, Flywheel, Starter motor, Jockey (Idler) pulley, Overhead Cam, Piston, Cylinder head, Oil drain plug.

        Draw a parts list, which shows the item number and name for **each** of these parts.

    (b)   Make a neat freehand sketch of a section through a typical piston with a connecting rod attached.

    (c)   The projections of a catch used for locking a set of wall bars to a gymnasium floor are shown in Fig. 5(b).

        Using isometric scale, draw an exploded isometric view of the catch.
        The view should illustrate clearly how the parts, labelled 1, 2 and 3 are assembled.
        Make corner X the lowest point on your drawing.

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

SECTION A

(a)   The pinion of a pair of meshing spur gears rotates at 100 rev/min and the larger gear rotates at 50 rev/min. The pinion has 12 teeth of involute form and a pitch circle diameter of 120mm. The pressure angle of the teeth is 20^0. Calculate, on your sheet, the following values for the larger gear:

(i)   number of teeth
(ii)   module
(iii)   addendum
(iv)   dedendum
(v)   pitch circle diameter
(vi)   circular pitch
(vii)   tooth thickness

Draw, full size, an elevation of the **larger gear** showing the profile of **two** consecutive teeth.

(b)   Fig. 6(a) shows a sectional detail of a feed screw for a machine.

Draw an elevation of the screw for a length of 192mm, showing the helical threads at both outside and root diameters.

OR

SECTION B

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

(i) Name **two** *editing* and **two** *viewing* commands available on a CAD system;
(ii) Explain the cause of *aliasing* on the display screen of a CAD system;
(iii) Explain the term *'Vector Graphics'*;
(iv) With reference to CAD, show the effect of changing the *text obliquing angle*;
(v) Sketch an example of *Baseline dimensioning*;
(vi) If the absolute co-ordinates of the start point of a line are (15, 30) and the end point is entered as (@-15, -30), what are the absolute co-ordinates of the end point;
(vii) With reference to CAD, show the effect of changing the *text width factor*;
(viii) Give two advantages of using a USB memory drive in preference to a floppy disk for storing CAD files.

(b) Name a CAD package that could be used to produce the 3D CAD model of a candlestick holder shown in Fig 6(b). Using sketches where appropriate, briefly outline the various steps involved and the commands used in generating the model.

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

(i) *Polar (Circular) array* and *Rectangular* array;
(ii) *Spline* and *Fit*;
(iii) *Associative* and *non associative* hatching;
(iv) *Pan* and *Move*;
(v) *Rotate* and *Revolve*.

(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 (400,250).

- Two circles are drawn as follows:
    Circle 1: Centre (90,100), Radius 70   Circle 2: Centre (50,100), Radius 15

- Three lines AB, BC and CD are drawn using the following absolute coordinates:
    A (175,130)   B (175,120)   C (190,105)   D (205,120)

- The lines BC and CD are subject to a rectangular array with one row, five columns and with a distance of 30 between the columns.

- A line is drawn, starting at the point (325,70) and ending at the point defined by the relative polar coordinates (@35<45). Another line is drawn, starting at the end point of the previous line and ending at the point defined by the relative polar coordinates (@35<135).

- A line is drawn from the point (325,70) to the point with relative coordinates (@-165,0). Another line is drawn from the point (175,130) to the point with relative coordinates (@-15,0). These two lines are then extended to meet circle 1 and the portion of the circle intercepted between them is trimmed out.

- The intersection between the lines and the circle are filleted using a radius of 10.

Blank Page

Blank Page