

GEOMETRICAL AND MECHANICAL DRAWING

GCE Advanced Level and GCE Advanced Subsidiary Level

<p>Paper 9351/01 Applied Geometry</p>

General comments

The standard of work presented in examination was largely the same as in 2001, although some candidates appear to have insufficient knowledge of the basic geometrical constructions that are necessary for the successful completion of the more complicated optional questions.

It was pleasing to note the high standard of presentation of work from many Centres.

Comments on specific questions

Section 1

Compulsory Questions

Question 1

- (a) Surprisingly, a number of candidates failed to locate the position of B1 accurately.
- (b) This was a relatively straightforward loci question in which many candidates gained full marks.

Question 2

- (a) Almost all candidates gained the three marks given for drawing the given views. It should be noted that equal credit was given for any geometrical construction for the ellipse, which produced the required degree of accuracy.
- (b) This part of the question was generally answered badly. Although some candidates gained full marks, many constructed a development of the curved side of the box based on a cylinder taken either on the major axis or minor axis of the ellipse. As a result, the development was incorrect both in length and in an incorrectly shaped top edge.

Question 3

The most common error in this question was a failure to draw the angle EAB accurately, which usually resulted in an incorrect length of DE and an irregular pentagon. One mark was given for the correct scale, one mark for the accuracy of the angle EAB and three marks for the other six dimensions.

A total of four marks was given for the accurate completion of the pentagon and the remaining three marks for the construction and accuracy of the heptagon. It should be noted that full credit was given for a regular heptagon based on an incorrectly constructed pentagon.

Most candidates gained satisfactory marks for this question, although there were some who drew a hexagon instead of the required heptagon.

Question 4

- (a) As expected, most candidates gained the three marks for drawing the given figure accurately.
- (b) This part of the question was generally answered badly. Despite the instruction that a third angle sectional view should be drawn, many first angle solutions were submitted. Although the flange of the elbow pipe was usually constructed and drawn correctly and gained up to three marks, relatively few solutions showed an accurate section SS of the pipe, for which up to three further marks were given. There were many answers in which the top edge of the section was drawn as a semi-circle. In addition, the line of intersection between the pipe and the flange, for which two marks were given, was either constructed inaccurately or omitted.

Section 2

Optional Questions

Question 5

The comparatively small number of candidates who attempted this question tended to gain very modest marks.

Most candidates constructed an isometric view of the clock case using the correct axes and gained three marks. Very few, however, gained a further three marks for using the isometric scale. It was surprising to see a number of scripts on which the isometric scale had been accurately constructed, but then not used.

The remaining marks were given for the accuracy of the isometric view.

To draw the curved sides of the clock, it was first necessary to draw the given side view, draw a horizontal grid on it and then transfer points on the curves to a similar grid on the isometric view. Most candidates attempted to locate the centres of the arcs and represent the curves on the isometric view as arcs.

A similar construction was also needed for the 72 mm hole.

A total of seven marks was given for appropriate constructions and six marks for accuracy of line.

As always, there were some solutions that were awarded full marks.

Question 6

- (a) Of the five marks given for drawing the section of the dam to the correct scale, three marks were given for a suitable construction for the parabola. A large number of candidates were unable to construct the parabola, drawing an arc instead.
- (b) Up to eleven marks were given for using a graphical integration method to determine the area of the dam. Most candidates demonstrated a satisfactory knowledge of this and lost marks only for minor inaccuracies. The remaining four marks were given for an accurate and correctly scaled answer.

Candidates who had failed to draw a semi-parabola lost the four marks for accuracy but could gain the marks given for method.

Failure to scale the solution was a common error and a number of answers showed the area of the dam in square millimetres.

Some credit was given for largely mathematical solutions.

Generally, answers to this question were very satisfactory.

Question 7

- (a) Almost all candidates who attempted this question gained the one mark for the view SV.
- (b) Auxiliary projection remains an area of the subject in which candidates appear to be less well practised. The first auxiliary view was often projected at the wrong angle and dimensions, particularly of the dovetailed slot, were inaccurate. Of the nine marks given for this view, three were given for the overall shape and size of a view which showed the true shape of surface A, four marks for the dovetailed slot and two marks for hidden detail.
- (c) Few candidates gained many of the ten marks given for the second auxiliary view. It should be noted that any correctly projected auxiliary view that showed the true angles of the dovetailed slot could gain full marks.

Question 8

Candidates continue to answer questions from this part of the syllabus very satisfactorily.

- (a) There were few candidates who drew the given diagram inaccurately.
- (b) Although the correct method was generally used, the magnitude of the reactions was often stated incorrectly. Obviously, this did not apply to candidates who took the precaution of checking their answer by other than graphical means. A total of six marks was given for this part of the question.
- (c) Otherwise very satisfactory answers were spoilt by a failure to indicate the positions of zero shear force on the drawing, as required in the question and, as a result, were penalised by two marks.
- (d) Seven marks were given for constructing the bending moment diagram. Again, many candidates were penalised for failing to give the magnitude and position of the maximum bending moment. Candidates should be reminded that full credit can only be given for an answer that satisfies all that is required in the question.

Question 9

There were very few satisfactory answers to this question.

Candidates appeared to be unable to interpret the question; largely, it would seem, as a result of not reading the question carefully enough.

One mark was given for the use of the correct scale, two marks for an overall interpretation of the text and two marks for correct sizes throughout.

Six marks were given for the construction of the helical groove, which had to be positioned in the centre of the tube. The remaining nine marks were given for accuracy: three for the solid lines of the helices; three for the broken lines of the helices; one mark each for the horizontal bottom lines of the groove and the semi-circular ends and one mark for a right-hand turn.

Again, candidates should be reminded of the absolute necessity of 'reading the question carefully'.

Paper 9351/02

Drawing: Engineering

General comments

The majority of candidates demonstrated a reasonably good understanding of the correct procedure for assembling the components of the Flow Control Valve, although a significant number failed to include the full details of the Quadrant sub-assembly.

As in previous years, candidates who had been prepared to invest time and effort in the production of a sketch of the assembled components, before attempting to complete the drawings required by the questions, generally progressed further, and scored higher marks, than candidates who were unprepared to make such an investment.

A significant number of candidates failed to produce any responses to the three design features required to complete the Flow Control Valve and, as such, failed to access the marks available for this section. This in turn limited their opportunities for gaining a high mark for the paper, as a whole. Where the design elements were attempted, solutions were often presented with little in the way of supporting annotated sketches to fully explain the candidates reasoning.

A common solution offered to seal between the Cover Plate and the Body to prevent fluid leaks was the use of some form of compressive washer, which was usually indicated on the drawing by a thick black line between the mating surfaces of the two components. At a simplistic level, this may have appeared to be an acceptable solution. However, candidates who made a more thorough analysis of this requirement realised that the detailed shape of such a washer could only be shown by the use of a supporting annotated sketch.

Methods of ensuring positive drive through the Pinion Shaft to the Pinion usually consisted of the use of a washer in addition to the locknut to the shaft. The preferred solution of some form of key with a mating keyway cut into both shaft and Pinion was much less common. Relatively few candidates produced a suitable solution to the final design requirement of fixing the Arm to the Valve Shaft in a manner that would allow adjustments to be made to their relative positions. While a number of candidates provided solutions that utilised split pins or similar, the more suitable solution of the use of a large grub screw through the end of the Arm, designed to lock onto a flat section produced on the end of the Valve Shaft was rarely seen.

On a more positive note, there was good evidence that drawing standards in terms of the quality of line, layout of views and projections between views, together with the use of accepted drawing conventions such as centre lines and section plane lines, have continued to improve.

Comments on specific questions

Question 1

- (a) The majority of candidates attempted the sectional elevation reasonably well, with most components being drawn accurately in shape and detail. However, significant common failings included the omission of the M6 bolts securing the Cover Plate, and the detail of the Offset Link. A number of candidates showed the Baffle in the closed position, rather than the open position as required by the question.

The process of hatching the sectional view was usually undertaken with some measure of skill, demonstrating a recognition for the need to ensure high levels of presentation by the majority of candidates.

- (b) The majority of candidates were less successful in completing the sectional end view than they had been in completing the sectional elevation. It would appear that many were confused by the path of the cutting plane Y-Y. Most were able to produce the required detail of the delivery tube, but relatively few could complete the required detail of the assembly of the Bush and the Crank, together with the Crank Arm and the Vertical Link. There was clear evidence that candidates who had drawn their own sketch of the assembly prior to attempting the questions, were more able to visualise just what was required to complete this view than candidates who had not pursued this method.
- (c) While candidates who attempted this view were usually able to complete the required details of the Body and the Valve Cover, only a small number of candidates could complete all the required details of the Quadrant and its linkages.

Question 2

The majority of candidates were able to draw correctly the symbol of projection, although in a small number of cases, the symbol drawn did not match the system of projection used in completing the required views.