

UNIVERSITY OF MALTA
THE MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL

ENGINEERING DRAWING

May 2009

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

**AM Engineering Drawing
May 2009 Session
Examiners' Report**

Part 1: Statistical Information

A total of 8 candidates sat for the advanced matriculation examination in Engineering Drawing.

GRADE	A	B	C	D	E	F	Abs	Total
Number	1	0	0	2	0	5	0	8
% of Total	12.50	0.00	0.00	25.00	0.00	62.50	0.00	100

Overview

The examination consists of two written papers, each of three hours duration. Each paper carries 100 marks and a candidate's final result is determined by combining the scores obtained in Paper I and Paper II with equal weighting.

Part 2: Comments regarding performance

This section gives comments on the performance of the candidates in each of the questions set in the two papers. They are intended to aid teachers and candidates in preparation for future examinations.

2.1 Comments regarding Paper 1

Eight questions were set and candidates had to answer any five. All questions carried a total of 20 marks.

Question 1- Warren Truss

The question concerned analysing graphically a Warren truss, finding the support reactions and the forces in the members.

This was one of the two most popular questions, each attempted by seven candidates. A very good performance was recorded, with two solutions warranting full marks. All the candidates copied the framework using the requested scale and used Bow's notation correctly. Two main approaches were adopted for evaluating the reactions. Some considered the equilibrium of the external forces as a general non-concurrent system, while others preferred to combine the applied loads, to reduce the system to three concurrent forces and solve it using a simple triangle of forces. Both methods are equally correct. Most unsuccessful candidates encountered problems when extending the basic force diagram to represent the equilibrium conditions present at each joint.

Question 2 - Auxiliary views

The question tested the construction of first and second auxiliary views.

Six candidates answered this question making it the second most popular, along with question 6 and question 8. Whilst one candidate got almost full marks, four failed to obtain a pass mark. These failed to make good consistent use of XY lines and showed no knowledge of the 'mechanical' procedure to be followed to derive auxiliary views. The candidates scoring low marks got only as far as the first auxiliary plan. The one high scorer managed to establish the corner points of the block in the second auxiliary elevation but then failed to identify the edges which showed and which did not.

Question 3 - Traces of a line and the true shape of a plane

The question featured the true length of an oblique line, its traces and the true shape of a plane.

The two candidates who attempted this question arrived only as far as parts (i)a and (i)b dealing with the true length of the line and its inclination to the principal planes. Neither one candidate knew how to handle part (i)c which asked for the points where the extended bracing member would intersect the wall and the ground. Besides being a standard procedure, some careful study of the given pictorial would have also indicated the steps to be taken. The intersection of the bracing member with the ground, or HT, is easily located by extending the elevation to hit the XY line and moving down perpendicularly to intersect the plan produced. The VT is found likewise, however starting with the plan. The derivation of the true shape of plane BAC involved looking along a side of the plane and then perpendicular to the resulting edge view.

Question 4 - Torsion spring

This question featured the subject area of 'helices', particularly the orthographic representation of a torsion spring corresponding to two given schematic views.

The question was the least popular. It attracted only one candidate. This is most disappointing when one considers the direct relevance this topic has to engineering and architectural applications like screw threads and geometrical stairs respectively. The solution involved exactly the same effort that the drawing of a standard square-section compression spring or a single-start square thread would entail.

Question 5 - Oblique plane

The question tested the candidates' knowledge about oblique planes. The question concerned a tetrahedron cut by an oblique plane.

Candidates who opted for this question and all obtained insignificant low scores. For a topic that features so regularly in this examination, this is a very poor performance.

All candidates found difficulty finding the overall height H_1 of the tetrahedron. As specifically asked by the question, the candidates were required to project a suitable first auxiliary view which showed the 100mm edge as a true length. This same view would then give also the required overall height H_1 .

It was clear that none of the candidates understood the setup of the remaining part of the question. Despite the simple wording used and the plan given mostly as hidden detail, candidates failed to visualise that the truncated solid stood *upside down* on the HP. As a consequence they could not derive the requested views.

Question 6 - Interpenetration

The question featured the interpenetration between a hemisphere and a triangular duct. Attempted by 6 candidates, this was one of the three second most popular questions. All the candidates scored below half the full marks.

The first part, dealing with the curve of intersection, was well handled by two candidates. The rest failed to visualise the hidden part of the curve of intersection.

None of the candidates made a sensible start with the second part of the question. This shows that they had no knowledge how to develop approximately a spherical surface. The method of development requested was that known as the 'zone' method, where the doubly curved surface was given approximated by two lower frusta and a top right cone, all stacked on top of the other.

Question 7 - Rack and pinion

This was one of the two most popular questions, each attempted by seven candidates. A common general pitfall was the determination of the module, m . This was superficially hidden under the given value of 6π for the tooth thickness. Candidates just had to equate 6π to $\frac{m\pi}{2}$ and by inspection, or otherwise, deduce that $m = 12$ mm. Some candidates did not even know the procedure and standard proportions to be used when designing a spur gear. Finally, the request to use a scale of 2:1 was not always honoured.

Question 8 - Cam

Six candidates answered this question making it one of the three second most popular, along with question 2 and question 6. Four candidates achieved half marks or more. It featured the design of a cam profile to satisfy given performance characteristics.

The majority respected the minimum cam diameter geometry and also established the correct zero lift level. Some candidates however mistook the separate UA and UR portions for UAR sections. Other common pitfalls included assuming an incorrect anticlockwise cam rotation and drawing an inappropriate offset circle. In general, a better performance was expected for such a straightforward question.

2.2 Comments regarding Paper 2

Four questions were set in all and the candidates had to answer question 1 (compulsory) and any other two. The compulsory question was allotted 60 marks whereas the other three carried 20 marks each.

Question 1 – Assembly drawing

This compulsory question was an assembly drawing exercise of a *belt-drive*. The overall performance was very disappointing, with only two candidates scoring beyond half marks. This is most alarming when one considers that such exercises represent the backbone of classical engineering drawing practice. Difficulties were experienced with all aspects of the exercise, namely:

- the putting together of the various parts;
- the relative positioning of the views, based on the chosen orthographic projection system;
- sectioning practice in general;
- sectioning practice specific to particular components like shafts, webs, bolts, nuts, washers, keys and spokes which all featured in the exercise;
- the representation of threads;
- the insertion of correct centrelines;
- drawing the requested local section through the base and work top in the left end elevation.

The general standard attained leaves much to be desired.

Question 2 - Limits and Fits

This question was chosen by 4 candidates only. Of these, one candidate produced a perfect answer achieving a full 20 marks, drawing the starkest contrast with the performance of the other three who practically got zeroes or other insignificant scores. It is evident that these latter candidates did not prepare well this part of the syllabus.

Question 3 - Geometrical tolerances / riveting

Seven candidates attempted this question, but again only one performed satisfactorily. The scores of the other six are not noteworthy, except for the purpose of establishing that that they had not studied the topics tested.

Question 4 – Welding symbols

This question was attempted by 3 candidates. The topic must have surprised the candidates because they all scored low marks, unworthy of mention. Such a distressing performance strongly stresses the need that candidates should study the entire syllabus content and not just the content of previous examination papers.

The Chairperson
Board of Examiners
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