

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**

MAY/JUNE 2004

**GEOMETRICAL MECHANICAL ENGINEERING
DRAWING**

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GENERAL COMMENTS

Generally there was a decline in the candidates' performance in 2004 from past years. Based on some of their responses, it would appear that candidates were not exposed to a wide variety of examples. This variety is critical, in helping candidates understand the concepts and procedures for solving different problems. There was some evidence that candidates had experiences with different engineering components, tools, equipment and engineering applications, but there must be increased opportunities for this type of interaction. There were instances where some centres had no candidates attempting particular questions, which indicated that those candidates had no knowledge of those topics. There was also a case where candidates from a centre attempted Paper 01 but failed to attempt Paper 02. This practice should not be encouraged.

The overall performance of candidates in this examination declined when compared with the performance of those who wrote the examination in 2003. In 2004, 80 per cent of the candidates achieved Grades I – V, compared with 92 per cent in 2003. This decline in performance was consistent across Modules 2 and 3, Solid Geometry and Mechanical Engineering Drawing respectively, and on Papers 01 and 02.

Candidates continued to show good drawing skills but failed to demonstrate the required level of knowledge and application of concepts particularly on Module 3 – Mechanical Engineering Drawing. Greater attention should be given to Orthographic and Auxiliary Projections in Module 2 – Solid Geometry. There was also a wide gap between candidates' performance on the Internal Assessment and their performance on the external papers.

DETAILED COMMENTS

PAPER 01

Question 1

This question assessed candidates' understanding of an archimedian spiral and their ability to perform the related construction.

It was attempted by approximately 66 per cent of the candidates and approximately 46 per cent of them gave satisfactory responses.

Part (a) of the question was generally very poorly done. Candidates emphasised the actual construction of the spiral rather than explaining the concept and definition.

In part (b), many candidates used the internal diameter as radius. Some candidates started plotting the points from the center of the circles and not from a point on the circumference of the 10mm diameter circle. It appeared that generally candidates were taught to start the spiral from the center and not from an internal circle.

Some candidates added the 100mm to the 58mm for the outside circle while some demonstrated no knowledge of an archimedian spiral.

Question 2

This question assessed candidates' ability to determine the centroid of a lamina. It was attempted by 73 per cent of the candidates. Most were able to divide the figure into three rectangles. Among those who did the question incorrectly, most could not find the ratio of the areas of the three rectangles. They had difficulty in dividing the sum of the first two areas by the third area to find the ratio.

Question 3

This question assessed candidates' knowledge of cam displacement diagrams. This question was attempted by 88 per cent of the candidates with 65 per cent earning satisfactory marks.

Part (a) was attempted by many candidates who performed satisfactorily. A few candidates did this part incorrectly and drew the uniform velocity as a horizontal line.

In part (b), performance on the simple harmonic motion was the best of the three parts for those who attempted the question.

Part (c) of the question was attempted by many candidates. Approximately 33 per cent of those who attempted the question did not understand how the vertical displacement was to be divided to obtain the uniform acceleration and retardation. Most of those who did it incorrectly applied the semi-circle to obtain the division of the vertical displacement. The drawing skills of the candidates varied greatly from weak to very good.

Question 4

This question tested candidates' ability to plot points and draw the curve of interpenetration.

The question was attempted by 80 per cent of the candidates with 65 per cent of those attempting the question receiving satisfactory marks. Approximately 40 per cent of the candidates did not understand the concept of the curve of interpenetration and how to project the points between different views. Most candidates demonstrated an understanding of orthographic projection. Some candidates were only exposed to the intersecting prisms with aligned centres, and not the areas with their centres were off set.

Question 5

This question assessed candidates' ability to draw an auxiliary view in order to obtain the true shape of a surface, cut by an inclined plane. This question was attempted by 77 per cent of the candidates with 64 per cent receiving satisfactory marks.

Most candidates did not understand that to obtain the true shape they had to project lines perpendicular to the surface. Most candidates also had problems plotting points in the auxiliary view and locating points from the plan to transfer to the auxiliary view.

Question 6

This question assessed candidates' ability to draw the development of the truncated right cone.

This question was attempted by 72 per cent of the candidates with 66 per cent of them receiving satisfactory marks. This question was attempted by many candidates. Few candidates did not draw the semi-circle to divide the base of the cone into 12 equal parts to join lines to the apex of the cone. Where these lines met the 15° line, some candidates did not draw lines horizontal to the side of the cone to obtain the true length. Some candidates drew the lines from the true base vertically to intersect the 15° line rather than joining them to the apex of the cone.

Question 7

This question assessed candidates' knowledge of the application of welding and machining symbols. Only 35 per cent of the candidates attempted this question. Thirty-four per cent of those candidates attempting the question received satisfactory marks.

Most of the candidates showed no knowledge of the meaning of the symbols. In some responses there was the indication that the machining symbol related to the surface lent, but generally candidates did not know how to demonstrate this using an illustration.

Question 8

This question tested candidates' ability to extrapolate dimensions from a drawing and their ability to accurately measure a drawing. This question was attempted by 78 per cent of the candidates with 78 per cent receiving satisfactory marks.

Many of the candidates demonstrated an understanding of the concept of 'dimensioning' and the ability to accurately measure the drawing. However, most did not know how to 'dimension' curves and circles. Candidates displayed very weak drawing skills in this question.

Question 9

This question tested candidates' knowledge of the tail stock of a center lathe and the wood turning lathe and also their sketching ability.

Only 27 per cent of the candidates attempted this question. Of those attempting the question 50 per cent received satisfactory marks.

Candidates' sketching ability varied from a highly artistic approach to a simple orthographic view. Most of the sketches were labelled. Some candidates gave a sectional view which demonstrated that they had knowledge of the tail stock and of working drawings.

PAPER 02

Question 1

This question assessed candidates' ability to plot the locus of a point. This question was attempted by 61 per cent of the candidates with 50 per cent of them receiving satisfactory marks. A number of candidates did not number the diagram. A misinterpretation of the diagram by some candidates was that they allowed the line AX to pass through the point X thereby arriving with a different locus.

Question 2

This question assessed candidates' ability to graphically find the second moment of area of a lamina about an axis along the base. This question was attempted by 33 per cent of the candidates with 24 per cent receiving satisfactory marks. One reason for the poor performance was that quite a number of candidates placed the axis and hence the pole in the wrong position. There is a worked example similar to the figure used in the examination, in the recommended text for this subject. The difference between the two diagrams is the location of the axis. Candidates assumed the question was identical and placed the axis in the incorrect position.

Question 3

This question assessed candidates' ability to construct the profile of a plate cam in order to impart different types of motion to an in-line roller follower. This question was attempted by 56 per cent of the candidates with satisfactory responses being received from 77 per cent of them. All candidates understood the importance of the direction of rotation of the cam as it related to the construction of the cam profile. Most candidates did not understand the concept of minimum radius. The simple harmonic motion and the dwell were well done. The uniform acceleration and retardation was not well done as most candidates had problems dividing the vertical axis correctly. The uniform velocity was also well done.

Question 4

This question assessed candidates' ability to draw the curve of intersection and development of two intersecting cylinders and also of the construction of the auxiliary view to obtain true shape. This question was attempted by 64 per cent of the candidates with 39 per cent giving a satisfactory performance. There was an error in one of the dimensions on the figure. Some candidates realized the dimension was wrong and made the correction. Some centres did extremely well while others performed poorly even though a compensation for the error was made during the marking process.

Question 5

This question assessed candidates' ability to construct a single start square thread applying the concept of a helix. This question was attempted by 24 per cent of the candidates with 93 per cent of them receiving satisfactory marks. A small number of candidates attempted this question and of those who attempted it, all but two did extremely well. There were some centres from which no candidate attempted the question.

Question 6

This question assessed candidates' ability to produce drawings in orthographic projection from isometric drawings. This question was attempted by 37 per cent of the candidates with only two per cent receiving satisfactory marks. The great majority of candidates performed poorly on this question.

Question 7

This question assessed candidates' ability to produce an assembly drawing from a detailed drawing. This question was attempted by 49 per cent of the candidates with 34 per cent receiving satisfactory marks. The identification of views (front end) was poorly done. The projection from view was also poorly done. Few candidates understood where a split pin is to be located and how it is installed. Few understood the construction of a nut. Some candidates had problems with the tangency aspect of the hook (blending of curves). Only one candidate turned the bracket upside down. The assembly of the crane hook was well done. The pulley was drawn satisfactorily. Most completed the first and third views, the second view was only partially completed.

Question 8

This question assessed candidates' knowledge of limits and fits, their ability to use the B.S. Data Sheet 4500A and their knowledge of components that require different types of fit. This question was attempted by three per cent of the candidates and all candidates scored zero. Candidates seemed unprepared for a question which focussed on basic concepts and procedures. It also appeared that the spreadsheet with the selected ISO fits – Hole Basis was not familiar to candidates.

Question 9

This question assessed candidates' knowledge of mechanisms and their sketching ability. This question was attempted by 24 per cent of the candidates with 57 per cent receiving satisfactory marks. Of the candidates who attempted this question most gave a satisfactory performance. A few candidates produced sketches of very good quality.