C A R I B B E A N E X A M I N A T I O N S C O U N C I L

REPORT ON CANDIDATES' WORK IN THE SECONDARY EDUCATION CERTIFICATE EXAMINATION

MAY/JUNE 2010

TECHNICAL DRAWING
GENERAL PROFICIENCY

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GENERAL COMMENTS

In the 2010 examination, the number of entries for the General Proficiency increased to 9315.

The revised syllabus and School-Based Assessment (SBA) format is now an established feature of the examination. Although performance on the SBA continues to be fairly good, there still remains room for improvement. Some teachers are still indicating that they have not seen syllabus amendments.

Teachers are asked to note the amendment to the syllabus (Appendix 1 – CXC 13/0/SYLL 005) which came into effect in 2006. This details the format for the SBA project and teachers are encouraged, as far as possible, to follow the recommended mark scheme.

Candidates are reminded to adhere to standard drawing practices, especially for Working Drawings and Assembly Drawings, for **all** papers. Significant declines in drawing standards have been observed on all papers. Generally, the use of scales as well as lettering, labelling and dimensioning are areas which need to be emphasized. When completing Working Drawings, all drawings must be fully labelled and dimensioned. In the case of Sectional Assembly Drawings, hatching lines to show various materials and cutting plane lines must be shown.

All topics outlined in the syllabus must be covered in order to adequately prepare students for the examination.

Candidates preparing for the examination in Technical Drawing are encouraged to acquire a background in at least one of the allied subjects of Industrial Arts. For example, a student choosing the Building Drawing option should be encouraged to also choose one of the Building Technology options. Likewise, a student choosing the Mechanical Drawing option should choose Mechanical Engineering at the CSEC level.

DETAILED COMMENTS

Paper 01 – Multiple Choice

This paper consisted of 60 multiple choice questions testing the profile dimensions of Knowledge (Profile 1), Application (Profile 2) and Practical Ability (Profile 3). Performance on this year's multiple choice paper declined over that of 2009. This year the average was 36, with a standard deviation of 9.66.

Paper 02 – Plane and Solid Geometry

Plane Geometry

Question 1

This question was designed to test candidates' ability to:

(a) Draw a line AB 150 mm long.

(b) Divide the line AB, geometrically, into seven equal parts.

(c) Draw a circle using five parts of the line AB as the diameter.

(d) Construct the largest regular pentagon that could be fitted within the circle.

Generally, candidates who attempted this question demonstrated a good knowledge of drawing the line AB to the correct length and dividing it geometrically.

However, most candidates demonstrated lack of knowledge of drawing the largest regular pentagon to fit within the circle. Some candidates could not accurately use the five parts to draw the required circle. Many candidates demonstrated limited knowledge in using the stated method to construct a pentagon or even to identify a pentagon.

Question 2

This question was designed to test candidates' ability to construct:

(a) A parallelogram ABCD, given the length of two adjacent sides and the angle between them

(b) A square equal in area to the parallelogram

Generally, candidates who attempted this question demonstrated good knowledge of constructing the parallelogram and were able to reproduce the given figure. However, some candidates could not go beyond that to construct the square equal in area to the parallelogram.

Question 3

Candidates were presented with the base, one side and an angle of a triangle. This question was designed to test candidates' ability to construct:

(a) The triangle ABC given the lengths of two adjacent sides and the angle between them.

(b) A triangle XYZ similar to triangle ABC and with a perimeter of 240 mm.

Generally, candidates who attempted this question demonstrated good knowledge of constructing the given triangle, ABC. However, many candidates were unable to demonstrate knowledge of constructing the similar triangle XYZ given the perimeter of 240 mm. In some cases, a similar triangle was drawn as a separate figure.

Question 4

Candidates were presented with a figure representing a simple link mechanism with given dimension.

Candidates were required to:

(a) Copy the given mechanism.

(b) Plot the locus of point 'P' as OA makes one complete revolution.

Generally, candidates who attempted this question demonstrated a good grasp of copying the mechanism and plotting the locus of 'P' accurately showing the rotation of OA. However, some candidates experienced difficulty and were unable to demonstrate their knowledge of moving point 'B' along XY in order to plot the path of point 'P'.

Solid Geometry

Question 5

Candidates were presented with a figure showing the Front Elevation and Plan of an I-shaped bar. They were expected to draw:

(a) The given Front Elevation and Plan

(b) An Auxiliary Elevation of the bar on the XY line.

Generally, candidates who attempted this question demonstrated a good grasp of drawing the given Front Elevation and Plan. However, some candidates were only able to demonstrate limited knowledge of drawing the Auxiliary Elevation of the bar on the given XY line. Candidates were unable to demonstrate understanding in projecting lines perpendicular to the auxiliary axis.

Question 6

Candidates were presented with a figure showing two orthographic views of a truncated right rectangular prism. This question was designed to test candidates' ability to draw full size:

(a) The two given views.

(b) The development of the truncated right rectangular prism with C_1 C_1 as the seam.

Generally, candidates who attempted this question demonstrated good knowledge of drawing the given views, from the given dimensions, in orthographic projection.

However, some candidates demonstrated a lack of knowledge and understanding in completing the development of the truncated rectangular prism. Many candidates were unable to identify the correct position of the seam on the figure.

Question 7

Candidates were presented with two incomplete orthographic views of a cylinder intersecting a hexagonal prism at 60˚. This question was designed to test candidates' ability to:

(a) Draw the given views.

(b) Complete the elevation showing the curve of interpenetration between the hexagonal prism and the cylinder.

(c) Complete the plan showing the curve for the end of the cylinder.

Generally, candidates who attempted this question demonstrated good knowledge and understanding in drawing the given views. However, some candidates demonstrated limited knowledge and so were not able to complete:

(i) The elevation with the curve of interpenetration between the hexagonal prism and the cylinder.

(ii) The plan showing the curve for the end of the cylinder.

Question 8

In this question, candidates were presented with orthographic views of a Wooden Block. The question was designed to test candidates' ability to:

(a) Draw an isometric view of the Block with 'S' as its lowest point.

Generally, candidates who attempted this question demonstrated good knowledge of the isometric principles for drawing the Block with 'S' as its lowest point.

Paper 03/1 – Building Drawing

Question 1

Candidates were presented with the outline of a floor plan for a two-bedroom low income residential project. The building was to be of concrete block construction and covered with a gable roof.

In Part (a) candidates were required to draw to a scale of 1:50, the full sectional drawing of the building. The Working Drawing was to include the following:

– Foundation
– Floor
– Walls
– Roof
– At least three vertical dimensions

In Part (b), candidates were required to draw to a suitable scale, an enlarged sectional view of a typical floor detail. All sectional floor and foundation details were to be shown.

A suitable title and the scale used were to be printed at the base of **each** drawing. Specifications for all construction members were provided.

Many candidates who attempted this question demonstrated a high level of knowledge, understanding and ability in drawing a full sectional drawing of a building to a scale of 1:50. The section details, especially floor and foundation sections, were well done.

Although the enlarged sectional floor detail was generally well done, many candidates experienced some difficulty in completing the drawing. The Damp Proof Membrane (DPM) was an important aspect of floor construction which was omitted by many candidates. Principles of section drawing, for example, hatching, were not adhered to and some candidates experienced much difficulty in representing roof members in section.

Other aspects of weakness were the quality of labelling, vertical dimensioning techniques and the omission of the printed title and scale used as required by the question.

In producing the drawings for this question, most candidates did not adhere to the principles of good Working Drawing practice. Consequently, they were unable to score the maximum marks allotted for the question.

Teachers are asked to remind candidates that this is the '**Working Drawing**' section of the examination. As such, standard drawing practices and conventions for completing Working Drawings are to be followed.

Question 2

Candidates were presented with the outline of a floor plan for a two-bedroom low income residential project. The building was to be of concrete block construction and covered with a gable roof.

In Part (a), candidates were required to draw to a scale of 1:50, the completed floor plan for the building to show:

Wall thicknesses

– Kitchen appliances and base cupboards
– All doors and windows
– Bathroom fixtures
– Names of all rooms
– 10 external dimensions
– 2 overall dimensions

In Part (b), candidates were required to draw two views of the building to a scale of 1:50, namely:

(i) The front elevation

(ii) The side elevation

A suitable title and the scale used were to be printed at the base of **each** drawing. Specifications were provided for all construction members. Standard drawing practices and conventions for drawing floor plans and elevations were to be followed.

Many candidates who attempted this question demonstrated a high level of knowledge, understanding and ability in drawing the floor plan at a scale of 1:50. However, candidates seemed not to fully understand the use of scales. For example, although they drew the plan at the correct scale, in many cases, bathroom fixtures were drawn too small and were therefore not practical.

The inclusion of drawing features such as internal and external walls, doors and windows as well as kitchen appliances were aspects well done. Labelling of rooms and dimensioning techniques were also done satisfactorily.

Although the floor plan was generally well done, some candidates seemed to experience difficulty in interpreting the required elevations for the building. In most cases, they experienced difficulty in interpreting the roof design and the porch in elevation.

Other aspects of weakness were the quality of labelling, dimensioning techniques and the omission of the printed title and scale used as required by the question.

In producing the drawings for this question, most candidates did not adhere to the principles of good Working Drawing practice. Consequently, they were unable to score the maximum marks allotted for the question.

Question 3

Candidates were required to make a neat, well-proportioned sketch to show a detailed sectional view of a sliding window in a masonry wall. Sketches were to include hatching to show material representation. All main components were to be clearly shown and labelled.

The majority of candidates who attempted this question did a good job of executing the sketch in good proportion. Although most candidates were able to identify some kind of window, some candidates could not identify the sectional view of a sliding window. Some drawings were produced in elevation.

Labelling and sizing of members were aspects which were done satisfactorily. Attention must be given by candidates to **all** aspects of the syllabus. Drawing of a detailed section of a sliding window (horizontal and vertical sliding) appears to be an area of weakness.

Question 4

This question tested candidates' ability to make a neat well-proportioned three-dimensional sketch to illustrate an exterior view of the given building when viewed with 'X' as the lowest point. All external features were to be clearly shown.

Candidates who attempted this question demonstrated a good grasp of the concept of pictorial sketching in proportion. However, the majority of candidates were unable to correctly interpret the roof design and include the porch in the drawing.

In some cases, candidates produced a roof plan instead of the full pictorial drawing.

Paper 03/2 – Mechanical Engineering Drawing

Assembly Drawing

Question 1

Candidates were presented with an enclosed sheet showing first-angle, orthographic projection details of the parts which make up a Shaft Steady Assembly.

In Part (a), candidates were required to draw, full size, in first-angle or third-angle orthographic projection, the following views of the Shaft Steady when fully assembled:

(i) A full sectional front elevation taken on the cutting plane line A–A

(ii) The end view looking in the direction of arrow 'B'

Candidates were also required to show hidden details only on the end view and the cutting plane line on the end view.

In Part (b), candidates were required to show six main dimensions, including a length, a diameter, a radius and a metric screw thread specification.

In Part (c), candidates were required to print the title, 'Shaft Steady Assembly', the scale used, and show the projection method used by symbol.

Most candidates who attempted this question demonstrated good knowledge, application and practical ability in correctly assembling the parts and the majority correctly positioned and aligned the views in relation to the orthographic projection method used. Correctly applying dimensions to the drawing was another aspect of the question that was well done. Candidates demonstrated that they were aware of and could apply the principles involved in dimensioning orthographic drawings.

Aspects of the question that were not well done included section details and cross-hatching to distinguish components that have been cut from those that have not been cut. For example, candidates did not know how to treat the 'Hinge Pin' and 'Pivot Pin' to distinguish them from other components. Additionally, candidates were challenged in showing the internal details for the slotted ends of the 'Shaft Body' and 'Shaft Cap'. Some candidates sectioned these areas as though they were cut. Some candidates also had difficulty showing distinctions between the webs and other parts of the assembled steady. Other aspects of the drawing that presented challenges included showing centre lines for shafts, such as holes, showing cutting plane lines and some dimensioning according to specifications.

Candidates need to complete more Sectional Assembly Drawings to show internal details of parts; the application of varying line types, particularly hatching lines, centre-lines and cutting plane lines; and handling features such as webs. Although printing the projection method, scale and title of the drawing have improved, some candidates still need to work on these aspects. Overall, candidates still need to pay attention to linework and dimensioning.

Question 2

Candidates were presented with an enclosed sheet showing first-angle, orthographic projection details of the parts which make up an 'Angled Winding Jig Assembly'.

In Part (a), candidates were required to draw, full size, in first-angle or third-angle orthographic projection, the following views of the angled winding jig when fully assembled:

(i) A full sectional, front elevation taken on the cutting plane line B–B.

(ii) The plan with hidden details shown.

In Part (b), candidates were required to show six main dimensions, including a length, a diameter, a radius and a metric screw thread specification.

In Part (c), candidates were required to print the title, 'Angled Winding jig Assembly', the scale used, and show the projection method used, by symbol.

Most candidates who attempted this question demonstrated good knowledge, application and practical ability in correctly assembling the components and they correctly positioned and aligned the views in relation to the projection method used. Dimensioning the finished drawing was another aspect of the question that was generally well done. Most candidates demonstrated sound knowledge and application of conventional symbols such as fillet and chamfer. The requirement for candidates to demonstrate knowledge and application of screw threads and hidden details was generally met.

In this question, some candidates experienced difficulty with positioning the split bushing on the 12 mm diameter end of the winding shaft and showing the details in the sectional front elevation. Another aspect of the question that candidates had challenges with was the use of appropriate hatching lines to distinguish different parts of the assembly. Candidates are reminded that sectioning conventions in mechanical engineering use hatching lines in different directions to indicate different parts of the assembly, and where several parts are in close proximity and are all cut, then the closeness of the hatching lines are varied to distinguish these parts. Other aspects of the drawing that presented challenges included showing centre lines for shafts, such as holes, showing cutting plane lines, and in some instances, completing dimensioning according to specifications.

Sketch and Design OR 3D Solid Model Design Drawing

Question 3

This question tested candidates' ability to use a neat, well-proportioned, isometric sketch to show the views of the given 'support bracket' assembled with 'B' as its lowest point.

Generally, candidates who attempted this question demonstrated good knowledge and application of the principles of orthographic projection to correctly interpret the given views and sketch the required figure with 'B' in the lowest position. However, a number of candidates had difficulty using the principles of drawing circles and curves in isometric to complete the required isometric sketch. As a result of this limitation, candidates' final sketch had curves and circles that were poorly drawn.

Sketching objects to proportion needs to be given attention as some candidates experienced difficulties with this aspect.

Question 4

This question tested candidates' ability to make neat, well-proportioned sketches to illustrate three of the following engineering features:

(a) A castle nut
(b) A slotted nut
(c) A stud
(d) A set screw

Generally, candidates who attempted this question experienced difficulty sketching the required engineering fasteners. Candidates experienced difficulty distinguishing between the slotted nut and castle nut. Additionally, knowledge of set screws and studs appeared to be very limited. This limited knowledge of engineering fasteners meant that candidates found it difficult illustrating them. Because all aspects of the syllabus are important, attention must be given to the entire syllabus, so that candidates are appropriately prepared to answer questions related to any part of the syllabus.

Paper 04 – School-Based Assessment (SBA)

There has been a general improvement in the performance of candidates in the 2010 SBA. Although the performance this year was good, there are still some candidates whose performance is not up to the required standard. The following points therefore need to be re-emphasized:

1. The drawing of objects to scale.
2. Omission of problem statements, conditions and justifications.
3. Reproduction of drawings without any modification.
4. Incorrect dimensioning of objects (dimensioning orthographic views).
5. Inconsistency with roof pitches from roof framing plan to elevations.
6. Dimensioning: problems range from the absence of dimensions to incorrect dimensioning techniques.

NOTES TO TEACHERS

Teachers must adhere to the parameters of the syllabus, for example, in the case of Building Drawing, candidates should concentrate on the planning of single-story buildings only.

Marks are allocated for pictorial drawing in the mark scheme. Teachers should therefore teach some form of pictorial drawings (Isometric, Oblique or Perspective). This will enable candidates to produce a three-dimensional drawing as part of the School-Based Assessment.

Problem statements, conditions and justification for the particular design must be submitted with the drawings. It is not possible to fully understand a design concept and make a judgment on the drawings produced by candidates if the design justification is not given. Candidates are required to solve a particular problem, not just reproduce a drawing. There must be some evidence of research done in order to solve the problem.

Teachers are therefore required to formulate problems in the various areas which will test candidates' ability to solve a problem. When marking assignments, teachers are reminded that they should also include the mark scheme detailing how the marks have been allocated for each student.