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 2009

TECHNICAL DRAWING

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GENERAL PROFICIENCY EXAMINATION
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GENERAL COMMENTS

In the 2009 examination, the number of entries for the General Proficiency was 8 793.

The revised syllabus and SBA format are now an established exercise. Although performance on the SBA (Paper 04) continues to be fairly good, there remains room for improvement. Some teachers are still indicating that they have not seen the 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 School-Based Assessment (SBA) project and teachers are advised to follow the recommended mark scheme as grading of their students may be seriously disadvantaged if they fail to do so.

Teachers are reminded to adhere to standard drawing practices, especially for working 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 the completing working drawings, all drawings must be labelled and dimensioned. In the case of sectional 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 candidates 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 candidate choosing the Building Drawing option should be encouraged to also choose one of the Building Technology options. Likewise a candidate choosing the Mechanical Drawing option should choose Mechanical Engineering at the CSEC level.

DETAILED COMMENTS

General Proficiency

Paper 01 – Multiple Choice

This paper consisted of sixty multiple choice items testing the profile dimensions of Knowledge (Profile 1), Application (Profile 2) and Practical Ability (Profile 3). The mean performance of candidates on the paper showed some improvement when compared to 2008.

Paper 02 – Plane and Solid Geometry

Plane Geometry

Question 1

This question was designed to test candidates' ability to:

(a) Construct a triangle ABC with an altitude of 70 mm and base angles CAB and ABC equal to 45^{o} and 60^{o} respectively.

(b) Inscribe the LARGEST square within the triangle, with one side lying on AB.

Generally, candidates who attempted this question demonstrated a good grasp of how to construct the triangle.

However, some candidates demonstrated lack of knowledge in constructing the triangle with the given base angles and altitude and also in inscribing the largest square within the triangle.

Question 2

Candidates were presented with a figure of a triangle with a wheel.

This question was designed to test candidates' ability to:

(a) Construct a right-angled triangle with a wheel diameter.

(b) Construct a cycloid for the circle rolling along AC of the triangle.

Generally, most candidates who attempted this question, demonstrated a grasp of constructing the triangle.

However, some candidates demonstrated lack of knowledge in constructing the cycloid from the initial starting point.

Question 3

Candidates were presented with the outline for a template.

This question was designed to test candidates' ability to:

(a) Reproduce the figure, showing clearly, the construction methods used for obtaining the straight line AB and the centre of the arcs required.

(b) Identify clearly the method of obtaining all points of tangency.

Generally, candidates who attempted this question demonstrated a good grasp in reproducing the given two circles and arc.

However, most candidates demonstrated a lack of knowledge of the construction for obtaining the centres for the required two arcs and the straight line AB.

Question 4

Candidates were presents with a rhombus ABCD with its diagonals AC and BD and a rod EF with a point P on it.

This question was designed to test candidates' ability to:

(a) Construct the rhombus with the given diagonal, sides, the rod EF and point P.

(b) Plot the locus of point P, as EF of constant length slides between the diagonals so that its ends E and F are always on the diagonals.

Generally, candidates who attempted this question demonstrated a very good grasp of constructing the rhombus to include the rod EF with points P.

However, most candidates demonstrated a lack of knowledge for sliding the rod EF between the diagonals and obtaining the locus of P.

Question 5

Candidates were presented with a figure showing the elevation and plan of a channel block, with the location of the picture plane, ground line, centre line of vision, sight-point, vanishing point and horizontal line for the preparation of a one-point perspective view of the channel block.

This question was designed to test candidates' ability to:

(a) Copy the given layout as shown.

(b) Construct a one-point perspective view of the channel block.

Generally, candidates who attempted this question demonstrated a good grasp in reproducing the given layout.

However, most candidates demonstrated lack of knowledge of constructing the one-point perspective view of the channel block.

Question 6

Candidates were presented with a figure showing the elevation and incomplete plan of a truncated hexagonal pyramid.

This question was designed to test candidates' ability to draw the:

(a) Given elevation and completed plan showing the cut surface

(b) Development of the truncated pyramid with seam as indicated

This question was popular and few candidates who attempted it demonstrated a good grasp in drawing the given elevation and completed plan.

Question 7

Candidates were presented with a figure showing the plan and elevation of a line AB.

This question was designed to test candidates' ability to:

(a) Draw the given plan and elevation.

(b) Determine the true length of AB, by revolution or auxiliary method.

(c) Measure and state the true length of AB.

Generally, candidates who attempted this question demonstrated a good grasp of drawing the line AB in plan and elevation.

However, some candidates were unable to determine the true length of the line AB by either method required.

Question 8

This question was designed to test candidates' ability to draw ONE complete turn of a right-hand helical circular cross-section spring, with a pitch of 120 mm, centre line diameter 116 mm and cross-section diameter 16 mm.

Generally, candidates who attempted this question demonstrated a good grasp of drawing the pitch and circular diameter with their division to obtain the helix.

However, most candidates were unable to complete the right-hand helical circular cross-section spring.

Paper 03/1 – Building Drawing

Question 1

Candidates were presented with the outline of a floor plan for a one-bedroom cottage at a hotel resort. The building was to be of concrete block construction and covered with a hip roof.

In Part (a) candidates were required to draw to a scale of 1:50, the completed floor plan of the building. The working drawing was to include the following:

- Internal and external walls
- All windows and doors
- Kitchen appliances, cupboards and cabinets
- Bathroom fixtures
- Names of all rooms
- Closets
- 6 main external dimensions
- 2 overall dimensions

In Part (b), candidates were required to draw to a scale of 1:200, the completed site plan for the building. The front of the building was to be placed parallel to the road and the completed drawing was to include:

- Proposed building
- Road/driveway
- Septic tank, soak away and sewer lines
- Distances from boundary lines
- Dimensions of property lines
- North arrow
- Trees and shrubs

A suitable title and 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 of the floor plan at a scale of 1:50. However, candidates seemed not to understand fully the use of scales, for example, instead of indicating the actual measurement of the object, they indicated the scaled measurement as measured on the drawing paper.

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 be still experiencing difficulty with drawing the bathroom fixtures to scale. In most cases, these were drawn undersized and incorrectly placed, thereby making them impractical.

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.

Teachers are reminded 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

In this question, candidates were presented with the outline of a floor plan for a one-bedroom cottage at a hotel resort. The building was to be covered with

Labelling and sizing of stair members were aspects which were done satisfactorily.

Question 4

This question tested the candidates' ability to make neat, well-proportioned sketches to illustrate details of the layout for a simple framed wooden partition indicating a door and window opening. All components were to be clearly labelled.

Candidates who attempted this question demonstrated a good grasp of the concept of pictorial sketching in proportion. However, the majority of candidates were only able to produce the drawing of the casement window.

Many candidates were unable to draw and label window members. In most cases, window types other than the one requested in the question were produced.

Attention must be given in the classroom to **all** aspects of the syllabus. Sketching of wooden partition components (Unit 3, Module 6, Specific Objectives 2 and 3) appears to be an area of weakness.

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 rotary tool head assembly.

In Part (a), candidates were required to draw, full size, in first-angle or third-angle orthographic projection the following views of the rotary tool head assembly when fully assembled.

(i) A plan showing all hidden details.

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

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, "Rotary Tool Head Assembly", the scale used, and show the projection method used by symbol.

Most candidates who attempted this question demonstrated good knowledge of assembling the parts and correctly positioning the views in the projection method used. This knowledge enabled the correct assembly of the given parts and the positioning and alignment of the required views in relation to the projection method used. Most candidates were also able to demonstrate understanding of the use of the correct cutting plane and to locate the cutting plane on the finished drawing. The required plan was generally well completed with most hidden details included. Candidates were also able to indicate the required engineering features such as fillet and chamfer on the assembly drawing.

Some aspects of the question that were not well done included incomplete sectional elevations. In this regard, some candidates demonstrated weakness in correctly using hatching to distinguish the different components and the web in the assembly. In some cases the web was hatched. The conventional representation of engineering features such as the knurl and screw thread was poorly done by some

candidates and teachers need to pay attention to how their students are made aware of the importance of such engineering features.

The dimensioning techniques caused concern. Attention needs to be paid by candidates to the selection of required dimensions and correctly completing the dimensioning techniques. Aspect of dimensioning that require additional practice include the correct shape and size of arrow heads, extension line details and indicating dimensions requiring metric symbols. Attention must be given to the use of appropriate dimensioning standards that adhere to CXC syllabus requirements, for example BSI PD 7308. Candidates still need to improve their line work. Reference is therefore made to syllabus UNIT 3, MODULE 3.

Question 2

Candidates were presented with an enclosed sheet showing first-angle, orthographic projection details of the parts which make up a swivel 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 swivel jig when fully assembled.

(i) A plan showing all hidden details.

(ii) A full sectional, front elevation taken on the cutting plane line A – A as it passes through the 12 mm diameter hole in the swivel link.

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, "Swivel Jig Assembly", the scale used, and show the projection method used, by symbol.

Most candidates who attempted this question demonstrated some knowledge and understanding of orthographic projection and correctly positioned and aligned the views in relation to the projection method used. Engineering features such as the knurl, chamfer and fillet were widely known.

However, many candidates demonstrated weakness with regard to the correct assembly of parts. The major issue was placing the parts in the correct positions. Hatching to distinguish the different components of the assembly was poorly done; with many candidates sectioning the web. As a result the sectional elevation was not always fully completed.

Dimensioning was another aspect of the drawing that was not well done. Attention must be given to the use of appropriate dimensioning standards that adhere to CXC syllabus requirements, for example BSI PD 7308.

Candidates need to improve their line work, including the use of construction lines, hidden lines and centre lines. Reference is therefore made to syllabus UNIT 3, MODULE 3.

Sketch and Design or 3D Solid Model Design Drawing

Question 3

This question tested the candidates' ability to use neat, well-proportioned, orthographic sketches for the conventional representation of the following engineering features:

(a) Fillet weld

(b) Grooved weld

(c) Hollow shaft/tubular section

(d) Cylindrical spring

(e) Spot face (two views required)

Generally, this question was not well done. Most candidates who attempted it were able to sketch the hollow shaft/tubular section, the fillet weld and to some extent the groove weld. However, most of the conventional representations required were either poorly sketched or not attempted at all. Candidates also had difficulty sketching proportionately in orthographic projection. The poor responses to this item suggest that this aspect of the syllabus is either not taught or insufficient practice is provided. Reference is therefore made to syllabus UNITS 3, MODULES 5, 6 and 7.

Question 4

Candidates were presented with a sectional elevation and an end elevation of a support bracket in first-angle orthographic projection. They were required to sketch in isometric projection, the support bracket.

Generally, candidates who attempted this question satisfactorily converted the orthographic views to a proportional isometric figure. However, many candidates were unable to orient the isometric sketch to show the sectional details as required. Candidates should be exposed to more practice in drawing isometric views, particularly with respect to orienting drawings according to given instructions.

School Based Assessment

There has been a general improvement in the performance of the candidates in the SBA in 2009. Of the 164 centres moderated, grades for 112 were accepted while 52 had to be adjusted. Although the performance this year was good, there are still some candidates whose performance is not up to the required standard for CXC.

The moderating team, however, realizes that there are a number of problems which have to be solved in order for candidates to produce improved performances in the future.

These problems include:

(a) The drawing of objects to scale

(b) Omission of problem statements, conditions and justifications

(c) Reproduction of drawings without any modification

(d) Incorrect dimensioning of objects (dimensioning orthographic views)

Projects

Some projects were too simple and were therefore not suitable to be used as an SBA assignment. Candidates can redesign existing engineering devices; however, the drawings must show how these improvements are to be achieved.

Also some devices which were designed were non-functional. Teachers should make sure that their students understand that the project which they design should be functional.

Dimensioning

All dimensions should be metric and should reflect that the candidates know how to correctly draw to scale. Drawings coming to the marking team indicate that candidates have been dimensioning projects using measurements which they used to draw the object on the paper. In most cases, these dimensions do not reflect the actual size of the object. Drawings should be drawn to a scale.

Auto Cad drawings

When drawings have been produced using CAD, candidates should show that they understand how to differentiate between construction lines, outline, hidden lines and the like. Therefore, the weighting of the lines should be reflected. If candidates are not fully competent in the use of the CAD program, then they should not be allowed to complete the assignment using the computer.

There is a misconception among candidates that a drawing produced using the computer will be awarded high marks. These drawings must meet proper drawing standards. Marks awarded by the teacher should be shown on the candidates profile sheet. These sheets should be attached to the candidate's work. Teachers are once again reminded to use the mark scheme which is provided by CXC. Failure to do so will place their students at a disadvantage.