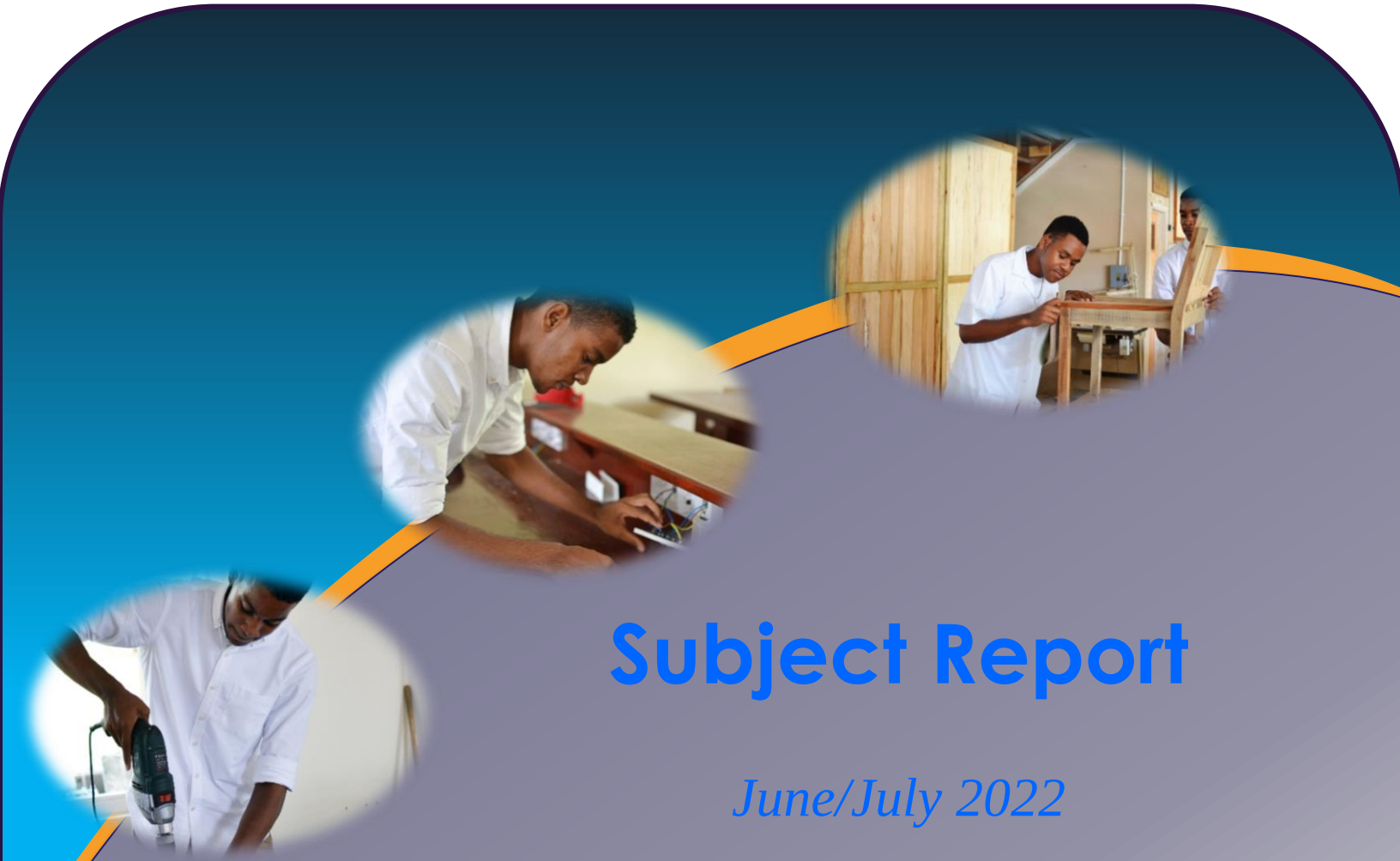
CARIBBEAN EXAMINATIONS COUNCIL

INDUSTRIAL TECHNOLOGY



Subject Report

June/July 2022

CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

JUNE/JULY 2022

INDUSTRIAL TECHNOLOGY
GENERAL PROFICIENCY

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INTRODUCTION

This guide has been put together based on candidate responses to the 2022 June/July examination in CSEC Industrial Technology, Option B — Mechanical Engineering Technology, Paper 02.

This year, there was a slight decline in the performance of candidates. Approximately 81 per cent of candidates earned a passing grade when compared with approximately 82 per cent in 2021. There was a decline in performance in all profiles.

PAPER 02 – STRUCTURED ESSAY

This is one of three papers that candidates are required to write to satisfy the requirements for the subject. Paper 02 consists of five structured/essay type compulsory questions drawn from the four sections of the syllabus — Materials, Hand Tools and Processes, Graphic Communication and Design, Production Engineering and Metal Artwork. It is typical that the questions are broken into a number of parts covering different aspects of the sections of the syllabus, allowing candidates to pull on a wide area and thus making the examination very accessible.

OPTION B – Mechanical Engineering Technology

Question 1

Question	Strengths	Weaknesses
(a) Candidates were required to identify and state the function of any three of five labelled parts of an electric arc furnace.	Many candidates were able to say what the function of the parts were.	Many candidates did not know what the labels represented. Some incorrect responses included the following. • Part A — a vent • Part B — a switch to turn the furnace off and on • Part E — the power source Responses such as these indicated that candidates were not familiar with the diagram of an electric arc furnace.
(b) Candidates were asked to describe the steps required to develop a hanging wire basket business which capitalizes on the observation that rusting was taking place on hanging wire baskets that were being used for growing exotic flowers in open spaces.	Candidates were able to apply the IDEATE principle.	Candidates appeared confused regarding what was expected from the question, that is, they were unsure whether they needed to develop a business plan. As a result, very few responses were correct.
(c) Candidates were required to outline six sequential steps for producing a missing chess piece using greensand casting, assuming that they had a pattern made of wood.	Candidates who were familiar with this topic provided some good responses which clearly outlined the steps to cast the chess piece.	Candidates who were not exposed to the topic treated it as lathe work with parallel and taper turning. Some candidates created a template to produce the object. Some candidates even outlined steps for making the piece out of wood. Many candidates also went about giving steps for making a model although a model was provided.

Question 2

Question	Strengths	Weaknesses
(a) Candidates were asked to define (i) engineering stress and (ii) engineering strain.	Candidates showed some knowledge of force and its relationship with stress and strain. *Force applied* was the most frequent response for the definition of engineering stress and *deformation* was the most frequent response for the definition of engineering strain.	Very few candidates were able to highlight that stress is force per cross-sectional area, and that strain is related in that it is the extension when force is applied. Responses to the question suggest that candidates were not exposed to the topic.
(b) Candidates had to determine (i) the engineering stress and (ii) Young's modulus or modulus of elasticity based on the details given in a scenario. As an extension to Parts (b) (i) and (ii), Part (b) (iii) required candidates to state (with justification) whether it is possible to use an aluminium rod of specific dimensions to construct support for an object based on the details given.	Very few candidates were able to calculate the force. Some candidates were able to give the formula for stress and area. For (b) (iii), most candidates knew that aluminium was not the better material to use.	Many candidates provided an explanation instead of a calculation. Responses suggest that many candidates were unfamiliar with the topic. For (b) (iii), candidates did not seem to know that they had to use the information provided in the table. Candidates did not focus their response on the elasticity of the materials or what was bars.
(c) Candidates were provided with a scenario regarding an automobile workshop. Candidates were then asked to draw and label a sketch to show how the vehicle's engine could be suspended using the steel rod.	There were varying responses such as *hanging from the roof, using a hoist,* and *using a pulley system*.	Many candidates did not label their sketches.

Question 3

Question	Strengths	Weaknesses
(a) Candidates were given three heat transfer methods in a table and asked to place an X in the appropriate column in the table to identify the medium or vacuum in which each method is possible.	Many candidates were able to either accurately identify the medium or indicate whether vacuum was appropriate for the heat transfer method.	Some candidates placed X in all the cells. Some wrote the words solid, liquid, gas or vacuum in the cells. Candidates seem to be guessing their response, rather than applying their knowledge of the terms.
(b) Candidates had to describe a typical application or observation in the workshop for each of the heat transfer methods given in the table.	The responses suggest that candidates had general knowledge of the application or observation of heat transfer methods, for example, for *radiation*, candidates gave the application of *using the microwave*.	Many candidates were unable to give adequate applications or observations of the heat transfer methods in the workshop environment. As a result, they provided general applications or observations. In addition, many candidates mixed up the conduction and convection methods of heat transfer.
(c) Candidates were presented with a customized bolt of specific dimensions and asked to describe six sequential steps for making the bolt in the workshop.	Many candidates were able to provide reasonable responses. They mentioned clockwise and anticlockwise to break the chip and the application of lubricant/oil/cutting oil.	Chamfering before starting to die was seldom mentioned. The question seemed to be misinterpreted by some candidates. Many candidates placed the workpiece on the lathe and proceeded to face, parallel turn and cut the threads.

Question 4

Question	Strengths	Weaknesses
(a) Candidates were asked to identify and briefly describe the function of any three parts identified on the drill press shown in a figure.	Many candidates were able to identify the parts (though not always using the correct name) and provide a reasonable explanation of the function.	Some candidates identified Part C as a switch, Part E as the power/electrical source and Part A as a cooling or air filter mechanism. Based on some of the responses it is reasonable to assume that many candidates had not seen an electric arc furnace.
(b) Candidates were required to calculate the gears required to cut a screw with 8 threads per 25 mm on a lathe with a leadscrew of 5 threads per 25 mm. They were then asked to interpret the calculation used.	No strengths were noted.	Based on the responses, it is reasonable to conclude that this topic is not being adequately addressed during teaching. Very few candidates had a response or a reasonable response to the question.
(c) Candidates were asked to describe the sequential steps for using pop-rivets to assemble a plywood seat to a metal frame.	Most candidates had reasonable responses such as *marking out, drilling and inserting the rivet and popping the rivet*.	A few candidates mentioned removing the burrs/sharp edge before inserting the rivet or checking that it was securely assembled. Some candidates indicated the use of nuts and bolts. This seems to have been the more popular method used in schools to secure plyboard to a desk and chair. However, the question specifically mentioned using rivets to undertake the assembly.

Question 5

Question	Strengths	Weaknesses
(a) Candidates were required to complete a table by naming and sketching two types of keys, stating one advantage and one disadvantage of each type.	The few candidates who provided responses named and/or sketched the square and woodruff keys.	Very few candidates were able to name or make reasonable sketches of mechanical keys. Many named and sketched vehicle keys, chuck keys, drill keys and others. Very few candidates had correct/reasonable responses for the advantages and disadvantages of keys. Based on the responses, it seems that little or no time was spent teaching this topic.
(b) With the aid of sketches, candidates had to list five steps required to produce the twisted portion of the metal bar shown in a figure.	Some candidates were able to provide reasonable sketches showing heating, clamping and twisting. Some candidates provided sketches showing twisting without heating.	A few candidates marked out before proceeding to heat. Some candidates drew sketches of the work piece being held on the lathe or hand drill to twist it. A few candidates mentioned marking out the section to be twisted before heating, clamping and twisting.

Recommendation

Teachers should place more emphasis on exam preparation and should go in depth on topics, paying special attention to the newer topics.