CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION MAY/JUNE 2005

ELECTRICAL & ELECTRONICS TECHNOLOGY

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GENERAL COMMENTS

This year represents a record setting year for the Electrical and Electronics Technology examination. There has been a significant increase in the number of candidates as 74 candidates wrote the examination compared with 30 in 2004. There has been significant improvement in the performance of candidates even though their improved performance appeared to be skewed to the electronics area.

Most candidates appear to be comfortable with the electronics related topic consequently, the scores obtained for Unit 1 and 2 were quite impressive. Like previous years it is evident that there is lack of understanding of some basic electrical and electronics concepts which affects the candidates' performance especially in the electrical related units.

Time seemed to be a function as most students had difficulty completing all questions on the exam. Good responses were received for Module 1 while candidates did not perform well on Module 3. It appeared that candidates ran out of time.

It is quite evident that the schools are doing a better job of preparing students for this subject. The standard of the answers continues to improve, with increase in number of candidates sitting the examination. However, more work is needed to get candidates to perform at the standard required for this level examination. Of the candidates who entered, a significant number of them have attempted more questions in the examination than in the past examination.

The examination offered a wide coverage of the syllabus, in fact, the two papers when combined, covered all Units in the syllabus.

PAPER 01 — SHORT ANSWERS

MODULE 1

Circuit Theory (Questions 1-10):

Candidates were required to use fundamental laws to solve electrical/electronics circuits. Less than fifty percent of the candidates scored above fifty per cent in Module 1. From a possible 30 marks, 16 candidates scored in the 21-30 range, 17 scored in the 16-20 range, 18 scored in the 10-15 range and the remaining 20 candidates scored below 10 points.

Comments:

Question 1

The most common error was that of ignoring the polarity of the cells in the circuit which led to an inaccurate calculation of the current.

Question 2

Candidates did not realize that the bigger current flowed through the smaller resistor.

Question 3

Some candidate ignored the units in the calculation and failed to perform the calculation correctly.

Question 4

Most candidates were able to state the Maximum Power Transfer theorem correctly.

Question 5

This question was fairly well done. The most common error was stating the units incorrectly.

Question 6

This question was fairly well done. The most common error was that the units were not stated.

Question 7

Candidates tended to explain the concepts of electromagnetic induction rather than stating the law in a concise fashion.

Question 8

This question was fairly well done. Candidates generally knew the formulae needed to calculate time-constant and the current in the circuit.

Question 9

The relationship for calculating impedance were generally well known. The response to this question was fairly good.

Question 10

This open-ended question produced al large variety of correct answers.

MODULE 2

Analogue & Digital Electronics (Questions 11-20):

Basic analogue and digital electronics concepts were covered in this module. This module proved to be somewhat challenging. Of the 71 candidates, only five scored above 20 points. Seventeen scored in the 16-20 range. Twenty-six scored in the 10-15 range and the remaining 23 scored below 10 points.

Comments:

Question 11

The most common error was that the diodes were not oriented in a proper manner. Some candidates also placed the filter capacitor in series with the load resistor.

Question 12

Most candidates were able to calculate I_c correctly but calculation of V_{ce} was beyond their capability.

Question 13

Many candidates were unable to identify the circuit and thus were unable to state the relationship between input and output.

Question 14

Candidates produced good responses to this question.

Question 15

While many candidates understood the commutation process, most could not recall the principle of forced and natural commutation.

Question 16

This question was fairly well done. Most candidates were able to convert between bases.

Question 17

Many candidates were able to produce the Boolean expression for the output. The primary weakness was that candidates did not show how they arrived at the answer.

Question 18

More than 50 per cent of the candidates did not know how to fill in the table.

Question 19

Most candidates were confused by this question. They described different types of electromagnetic waves.

Question 20

Most candidates drew the AM and FM waves but offered no explanation.

MODULE 3

Electric Energy Systems (Questions 21-30):

This was the most challenging module. None of the candidates scored above 13 points and 16 scored zero. Fifty-three scored in the 1-9 range and the remaining two scored in the 10-15 range. This reveals that most candidates were not prepared for this module.

Comments:

Question 21

This question was misinterpreted by candidates. A common response was friction as opposed to brush size.

Question 22

Most candidates defined mutual inductance instead of the unit of mutual inductance.

Question 23

This question was answered satisfactorily by most candidates.

Question 24

Most candidates were unfamiliar with the synchronous motor and thus were unable to give advantages of this motor.

Question 25

Many candidates were unfamiliar with the shaded pole motor and thus were unable to describe its operation.

Question 26

Most candidates were unsure of which type of relay to sketch. Sketches of many different types of relays were

produced.

Question 27

Many candidates knew that the SCADA system was used to transmit data but were unable to describe how the system works.

Question 28

Candidates were unable to differentiate between the various types of motors. They also appeared to be confused about labelling the devices.

Question 29

Most candidates answered part (a) satisfactorily, however, answers to part (b) were usually incorrect.

Question 30

Many candidates were unable to distinguish between slip speed and percentage slip.

PAPER 02 — ESSAY QUESTIONS

Candidates were required to do all six questions in this Paper which accounts for 150 marks. The standard achieved by candidates was higher than previous years. Most candidates attempted all sections, however, it appears at if Module 3 was the most challenging. The range of the marks obtained was zero to seventy-one. Ten candidates scored in the 50-71 range, twenty-four scored in the 30-49 range, thirty nine scored in the 10-29 range and nine scored below ten.

MODULE 1

Circuit Theory (Questions 1 & 2):

Candidates were required to determine currents in a two window mesh, definecapacitance and determine charge stored in a capacitor. In Question 2, candidates were required to solve RC series circuit and determine frequency, period and RMS current. Only two candidates scored in the 20-25 range for Question 1 and one in that range for Question 2. Nineteen candidates scored in the 10-19 range for Question 1 and three for Question 2. Sixty candidates scored below 10 marks for Question 1, of this 60, 10 either scored zero or did not respond to the question. Seventy-nine candidates scored below 10 marks for Question 2. Of this number, 37 scored zero or did not respond to the question.

Comments:

Question 1 (a)

Most candidates attempted this question and it was generally well done. Some candidates used superposition but encountered problems determining the currents due to confusion with the polarity of the current. Many of those who attempted the loop equations were able to obtain correct answers. Candidates did not use correct units I writing their answers. They also experienced problems with using the correct sign and ended up subtracting currents where addition was necessary.

Question 1 (b)

Candidates did not give a definition. Instead they gave a description. The definition includes the explicit relationship between the relevant qualities. Parts II and III were very poorly done. Decay equations were not known and in cases where the equations were known, they were incorrectly applied to the problem.

Question 2 (a)

Most candidates attempted this question but it was poorly done. Candidates were unable to find the frequency and therefore assumed a frequency to do part II of the problem. Few candidates were able to calculate the phase angle. It appears that the formula was not known.

Question 2 (b)

This section appeared to be beyond the scope of the candidates.

MODULE 2

Analogue and Digital Electronics (Questions 3 & 4):

Question 3 concentrated on the Common Emitter amplifier and digital circuitry, whereas, Question 4 concentrated on the operational amplifier and flip-flops. Only one candidate scored above 15 in Question three and four in Question 4. Twenty-seven candidates scored in the 10-15 range in Question 3, whereas, 21 scored in this range for Question 4. Fifty-four scored 10 and below (15 zeros) in Question 3 and 57 (five zeros) in Question 4.

Comments:

Question 3 (a)

Most candidates were not prepared to answer this relatively straight-forward question. Only few candidates were able to identify the purpose of the capacitors. All but one could determine the input impedance.

Question 3 (b)

The response to this section was generally quite good. Most candidates could draw the truth table, but many had difficulty simplifying the Boolean expression obtained. Most candidates could draw the circuit from the minimized expression.

Question 4 (a)

Many candidates could not identify the summing amplifier even though the input-output relationship was known. None of the candidates could derive the relationship.

Question 4 (b)

This response to this section was generally quite good. However, the explanations given by most candidates were inadequate.

MODULE 3

Electrical Energy Systems (Questions 5 & 6):

These questions were the most challenging and concentrated on several types of motors and transformers. No candidate scored above 10 marks in Question 5 and none above 14 marks in Question 6. One candidate scored in the 10-15 mark range for Question 5 and ten scored in this range for Question 6. Eighty candidates scored below 10 for Question 5 and seventy-one for Question 6. Thirty-four candidates scored zero for Question 5 and eleven scored zero for Question 6.

Comments:

Question 5

Very few candidates made an attempt to answer this question. It seems that very little is known about the synchronous motor.

Question 6

Many candidates experienced difficulty explaining self-inductance. The numerical parts of the question were poorly done.

School Based Assessment

Some centres submitted both samples of projects as well as written reports whereas, others submitted only written reports. The SBAs were moderate based on the written samples submitted. In some instances experiments were conducted, however, the results were not properly documented. Candidates failed to discuss the findings of the experiment or outcome of the project. Again, it appears that candidates are not encouraged to prepare their reports on projects in a timely manner.

Recommendations

1 Candidates need to spend more time on the electrical and electronics specialization. Only few candidates have demonstrated competency in electronics and few in electrical energy systems. Most candidates seem to be quite knowledgeable about circuit theories and electronics.

2 Practical exercises should be more closely monitored. It appears that candidates are focusing primarily on electronics at the expense of the electrical areas.

3 Sample projects should be made available in order to effectively moderate grades assigned by teachers.