CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION MAY/JUNE 2006

ELECTRICAL & ELECTRONIC TECHNOLOGY

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GENERAL COMMENTS

One hundred and thirteen candidates registered for Unit 1 and 11 candidates registered for Unit 2 in this examination. All candidates who registered for Unit 1 sat Paper 1, whereas 112 sat Paper 2. All eleven candidates who registered for Unit 2 sat both Papers 1 and 2.

The revised syllabus is being tested for the first time with candidates sitting two papers in Units 1 and 2. There has been a significant increase in the number of candidates when compared to last year. There was also incremental improvement in the performance of candidates when compared with the previous year, however, performance is still poor.

UNIT 1

PAPER 1 – SHORT ANSWERS

Module 1 – DC Circuit Theory (Questions 1 – 5)

Candidates were required to use fundamental laws and simple theory to solve simple DC circuits. Approximately 31 per cent, 35 candidates scored 50 per cent or above in Module 1. From a possible 30 marks, 15 candidates scored in the 21 – 30 range, 20 scored in the 15 – 19 range, 37 scored in the 10 – 14 range and the remaining 41 candidates scored below 10 marks.

COMMENTS

Question 1

Most candidates were able to find the total capacitance but many were unable to find the energy stored by the 20 microfarad capacitor because they did not calculate the voltage across the capacitor. Instead they used the 20V which led to erroneous results.

Question 2

This question was generally well done. Most candidates used the general formula to find the total resistance. Candidates who tried to use the current divider rule ran into difficulty as the rule only applies to two resistors.

Question 3

Many candidates ignored the current directions and polarity of the cell and this led to incorrect results.

Question 4

Most candidates were able to find the total inductance but failed to write down or use the Helmholtz equation.

Question 5

Many candidates were unable to convert from Kilowatts to Watts, therefore, yielding an incorrect answer for the current. Most candidates either did not write the equation for the temperature coefficient of resistance or exhibited poor mathematical skills in calculating the temperature.

Module 2 – Analogue Electronics & Communications (Questions 6 – 10)

Basic analogue and electronics and communications concepts were covered in this module questions were challenging for most candidates. Of the 113 candidates, only two scored 20 marks or above. Five scored in the 15 – 19 range. Twenty-two scored in the 10 – 14 range and the remaining 84 scored below 10 marks.

Question 6

Many candidates were unable to draw the circuit for the full-wave rectifier. The circuit diagrams produced indicated that the caandidates were unable to place the smoothing capacitor. The diodes were usually oriented incorrectly. Some candidates used the center-tapped transformer with two diodes but the circuits were usually incorrect. The majority of candidates who attempted Part (b) recognized that the clipping circuit would remove the lower half of the wave.

Question 7

Most candidates were unable to find the base current as they were unable to analyze the transistor circuit. Finding the collector current was also a major challenge for most candidates.

Question 8

Most candidates were unable to identify the operational amplifier configuration as an inverting amplifier, thus they were unable to complete the question.

Question 9

Most candidates failed to answer this question correctly as they were unable to identify the electromagnet spectrum. They were not able to give an application of each part.

Question 10

Many candidates were able to explain amplitude modulation but were unable to explain frequency modulation.

Module 3 – Introduction to Power Systems: (Questions 11 – 15)

This was the most challenging module. Only one of the candidates scored above 15 marks and 14 scored zero. Three scored in the 15 – 19 range. Eleven scored in the 10 – 14 range and the remaining 98 scored below 10 marks. Most candidates were ill prepared for this module.

Question 11

Some candidates were able to draw and label the cross-section of the d.c. but majority were unable to sketch or explain the speed – load characteristics for the motor.

Question 12

The question asked for an illustration of Faraday's Laws but most candidates just stated the law. Most candidates had difficulty calculating the e.m.f as they could not recall the formula.

Question 13

Most candidates were able to explain the operation of the fuse but were not able to sketch the inverse characteristic curve of the fuse.

Question 14

Most candidates were able to give advantages of digital communication but some went on to give very elaborate diagrams for Part (b) which was much more than required.

Question 15

Most candidates produced incorrect responses for Part (a) as the torque – slip relationship was not known. Part (b) produced better responses but many candidates had difficulty explaining the concepts.

UNIT 1

PAPER 2 – LONG ANSWERS

Candidates were required to do six questions from this paper which accounted for 150 marks. Questions 1, 4 and 7 were compulsory and carried 30 marks each. Candidates were required to select one of the remaining two questions in each module which carried 20 marks each. Most candidates attempted the required two questions from each module.

The range of the marks obtained was three to 113. One candidate scored above 100, whereas eight scored in the 70 – 100 range. 18 candidates scored in the 50 – 69 range, 38 scored in the 30 – 49 range, 47 scored in the 10 – 29 range.

Module 1 – DC Circuit Theory (Questions 1 – 3)

Candidates were required to do Question 1 and one other from this section. For Question 1, eight candidates scored in the 20 – 30 range, 31 scored in the 10 – 19 range, 54 scored in the 1 – 9 range, whereas 18 scored zero.

Seventy-three candidates attempted Question 2. Of this number, 21 scored zero, two candidates scored in the 10 – 15 range and the remaining 53 candidates scored between one and nine marks.

Thirty-five candidates attempted Question 3. Of this number, three candidates scored zero, three scored in the 10 – 15 range and the remaining 19 candidates scored between one and nine marks.

Question 1a

The answer produced by most candidates was fair. In general, candidates were able to state Thevenin's and Norton's Theorem.

Question 1b

Many candidates experienced difficulties completing this question. They used the wrong orientation to find the Thevenin's resistance.

Question 1c

This section of the question was fairly well done. The main problem observed is that candidates ignored the polarity of the cells and thus ended up with incorrect responses.

Question 1d

This section of the question provided challenge for most candidates. Many did not recognize that they should calculate the voltage drop across the device. Instead, they used the 27 Volts in their calculations.

Question 2a

Definitions for capacitance were not given. A definition should state how the quantity being defined is calculated.

Question 2b

Most candidates were unable to state or use charging or discharging formulae. Very few candidates made progress with this question.

Question 2c

Many candidates were able to score reasonable marks for this question.

Question 3

Many candidates experienced difficulties completing this question. Part (f) of the question was fairly well done.

Module 2 – Analogue Electronics & Communications (Questions 4 – 6)

Candidates were required to do Question 4 and one other from this section. For Question 4, six candidates scored in the 25 – 30 range, seven scored in the 20 – 24 range, 45 scored in the 10 – 19 range, whereas 50 scored below 10 including eight who scored zero.

Thirty-nine candidates attempted Question 5. Of this number 16 either scored zero or did not respond to the question, four candidates scored above 10 and the remaining 19 candidates scored between 1 and 9 marks.

Sixty candidates attempted Question 6. Of this number, 16 candidates either scored zero or did not respond to the question, two scored above 10 and the remaining 42 candidates scored between one and nine marks.

Question 4

Several candidates provided good responses to this question and scored 50 per cent or more of the available marks. Weaker candidates had difficulty identifying the circuit.

Question 5

Forty candidates attempted this question. Of this number, 15 either made no response or scored zero, six scored between 10 and 13 marks while the remaining 19 scored below 10 marks from a possible 20 marks. The candidates who attempted this question were unable to make progress as the relationship and equivalent circuits were not known.

Question 6

Sixty candidates attempted this question. Of this number, 16 either made no response or scored zero, two scored above 14 marks while the remaining 42 candidates scored below 10 marks from a possible 20 marks. Most candidates could not calculate the output voltage of the summing amplifier and knew very little about the Wein Bridge Oscillator.

Module 3 – Introduction to Electrical Power Systems: (Questions 7 – 9)

Candidates were required to do Question 7 and one other from this section. For Question 7, no candidate scored in the 25 – 30 range, one scored in the 20 – 24 range, 38 scored in the 10 – 19 range, whereas 70 scored below 10 including two candidates who scored zero.

Eighty-six candidates attempted Question 8. Of this number 14 either scored zero or did not respond to the question, five candidates scored above 10 and the remaining 67 candidates scored between one and nine marks.

Twenty-four candidates attempted Question 9. Three candidates either scored zero or did not respond to the question, four scored above 10 and the remaining 17 candidates scored between one and nine marks.

For Question 6, 80 candidates scored below 10 for Question 5 and 71 for Question 6. Thirty-four candidates scored zero for Question 5 and 11 scored zero for Question 6.

Question 7

This response to this question was generally poor. Only six candidates scored 15 marks and above from a possible 30 marks. Four candidates scored zero or did not attempt the question and 68 scored below 10 marks.

Question 8

Eighty-six candidates attempted this question. Of this number, 14 either made no response or scored zero, five scored 10 or above marks while the remaining 67 candidates scored below 10 marks from a possible 20 marks. Most candidates were unfamiliar with Lenz's Law and could not calculate variables for the DC generator.

Question 9

The response to this question was extremely poor. Only 23 candidates attempted this question. Of this number, three either made no response or scored zero, four scored 10 and above marks while the remaining 16 candidates scored below 10 marks from a possible 20 marks.

UNIT 2

PAPER 1 – SHORT ANSWERS

Module 1 – AC Circuit Theory (Questions 1 – 5)

Candidates were required to use fundamental laws and simple theory to solve simple DC circuits.

One candidate scored above 50 per cent in this module. Two scored in the 10 – 15 range. Seven scored in the 1 – 9 range and one scored zero.

Question 1

Two candidates scored four of six marks. Most candidates were capable of drawing a sine wave, but were unable to calculate the rms value of the wave.

Question 2

Although two candidates scored relatively high marks, all the others had difficulty with this question (more than 50 per cent scored zero). While some candidates could recall the relationship for phase angle and power factor, they could not carry out the required algebraic manipulation.

Question 3

Two candidates scored five marks for this question, six scored zero while the other four candidates scored either one or two marks. While many candidates correctly noted that $X_L = X_C$ at resonance, they were unable to calculate the cut-off frequency. Neither could they calculate the Q factor.

Question 4

Most candidates were unable to answer this question. Six candidates scored zero while three scored one mark only. The other two candidates scored three and four marks respectively. Most of the candidates did not recognize that the circuit was a parallel circuit and they used the series formula find the total inductance.

Question 5

Only two candidates provided relatively good responses. All others scored zero or one point. Most candidates correctly identified the filter as a low pass filter, many could not recall the cut off frequency formula. A variety of incorrect sketches of the frequency responses were seen.

Module 2 – Digital Electronics & Data Communications (Questions 6 – 10)

Basic analogue and electronics and communications concepts were covered in this module. This module proved to be somewhat challenging.

One candidate scored above 50 per cent (15 marks) in this module. One scored in the 10 – 15 range and the remaining nine candidates scored in the 1 – 9 range.

Question 6

This question tested the candidates understanding of the transistor when it was used as a switch. None of the candidates was able to produce an accurate response.

Question 7

Three candidates provided good responses, four scored zero for this question. Most candidates were able to construct the truth table for the circuit. Some candidates were confused about the method by which they should proceed to construct the truth table.

Question 8

Fifty per cent of the candidates responded well to this question. Some did not seem to know what a flip flop was and so were unable to proceed with the question.

Questions 9 & 10

Only four candidates attempted these questions. In particular most candidates had difficulty explaining the ring and star networks.

Module 3 – Introduction to AC Machines: (Questions 11 – 15)

For this module none of the candidates scored above 15 marks. Four scored in the 10 – 14 range and the remaining seven scored below 10 marks.

Question 11

All candidates attempted this question. However, the scores were relatively low. The majority had no difficulty defining primary and secondary windings could not carry out calculations for efficiency. Algebraic manipulation continues to be a serious weakness of many candidates.

Question 12

Only four candidates got marks for this question. The marks were relatively low (either one or two). Very few candidates were able to make a sketch and label the motor. Most candidates were unable to define slip

Question 13

Five candidates provided no responses to this question. Others scored between one and four marks.

Question 14

All candidates except one attempted this question, however only one managed to score four points. Others scored either one or two marks.

Question 15

All candidates except one attempted this question, two scored three marks whereas others scored between zero and two marks. Most candidates were able to identify uses of the induction motor but were unable to sketch the slip versus torque characteristics of the motor.

UNIT 2

PAPER 2 – LONG ANSWERS

Candidates were required to do six questions from this paper which accounted for 150 marks. Questions 1, 4 and 7 are compulsory and carried 30 marks each. Candidates are required to select one of the remaining two questions in each module for 20 marks each. All candidates attempted the required two questions from each module.

The marks obtained by candidates ranged from 21 to 101. One candidate scored above 100, whereas two scored in the 70 – 100 range. One candidate scored in the 50 – 69 range, four scored in the 30 – 49 range, and the remaining three candidates scored in the 20 – 29 range.

Module 1 – AC Circuit Theory (Questions 1 – 3)

Candidates were required to do Question 1 and one other from this section. For Question 1, one candidate scored in the 25 – 30 range, one scored in the 20 – 24 range, one scored in the 10 – 19 range, whereas the remaining seven candidates scored below 10 marks.

Seven candidates attempted Question 2. Of this number, two candidates scored in the 15 – 20 range and the remaining five candidates scored below six marks.

Four candidates attempted Question 3. Of this number one candidate scored zero, two scored below 10 marks and one candidate scored 20 marks.

Question 1

This question which tested knowledge of Q factor was poorly done by most candidates. It seems the relationship for Q factor was not well understood. They were also at a loss when it came to calculations of power factor.

Question 2

Seven candidates attempted this question but it was poorly done by five candidates. Those candidates who attempted it were able to state the resonance relation but were unable to perform the necessary calculations. Algebraic manipulation was a major weakness of those who attempted the question.

Question 3

Four candidates attempted this question. One candidate provided a relatively good response. Weaker candidates could only draw one type of filter, usually the low pass filter. The major weakness was the inability of most candidates to sketch the frequency response for the filters. Calculation of the cut off frequency proved to be a problem as most candidates quoted the formula f =1/2ðRC and were unable to proceed as there was no capacitor in the circuit.

Module 2 – Digital Electronics & Data Communications (Questions 4 – 6)

Candidates were required to do Question 4 and one other from this section. For Question 4, no candidate scored in the 25 – 30 and the 20 – 24 ranges, three candidates scored in the 10 – 19 range, whereas seven scored below 10 marks.

Three candidates attempted Question 5. One scored 16 marks and the remaining two scored five and six marks each.

Eight candidates attempted Question 6. Two scored in the 10 – 15 range and six candidates scored below ten marks.

Question 4

The majority of the responses to this question were poor. Analysis of transistor circuits was the major weakness of candidates.

Only part (f) of the question produced a response from the candidates. The major weakness with part (f) was that candidates tended to draw counter configurations for the shift register.

Question 5

This question was unpopular. Only three candidates attempted it. Of this number, one scored 16 marks and the other two scored five and six marks respectively.

Question 6a

This question was attempted by eight candidates. However, the responses were poor. One candidate scored 14 marks, whereas all others scored below 10 marks. Many were able to complete the truth table but then were at a loss when writing down the Boolean expression and had difficulty when asked to draw the circuit.

Question 6b

The candidates who attempted this part of the question produced circuits which were incorrect. The right type of flip flops were used but candidates did not know how to connect them to produce a correct circuit.

Module 3 – Introduction to AC Machines: (Questions 7 – 9)

Candidates were required to do Question 7 and one other from this section. For Question 7, no candidate scored in the 25 – 30 range, one scored in the 20 – 24 range, seven scored in the 10 – 19 range, whereas the remaining three candidates scored below 10 marks.

Three candidates attempted Question 8, and seven candidates attempted Question 9 candidates scored below 10 marks.

Question 7

All candidates attempted this question and the responses were impressive. Six candidates scored in excess of 15 marks and the remaining five candidates scored between five and 11 marks.

Question 8

Three candidates attempted this question. The responses were poor. Attempts were made at sketching the dynamo but the sketches produced were poor, and candidates were not able to do the calculations

Question 9

Seven candidates attempted this question but all scored below 10 marks.

INTERNAL ASSESSMENT

Some centres submitted samples of candidates' projects as well as written reports whereas others submitted only written reports. The Internal Assessment moderated based on the written samples submitted. For the most part, the reports were properly written. Candidates failed to discuss the findings of the experiment or outcome of the project.

RECOMMENDATIONS

1. All teachers should use the same report forms. Some teachers used the old forms.

2. Candidates could benefit from closer supervision in carrying out Internal Assessment.

3. Teachers are reminded to follow the Procedures for the selection of Internal Assessment samples. (SEE INTERNAL ASSESSMENT MANUAL FOR PRINCIPALS).