CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION MAY/JUNE 2008

ELECTRICAL AND ELECTRONIC TECHNOLOGY (TRINIDAD AND TOBAGO)

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GENERAL COMMENTS

Twenty-five (25) candidates registered for Unit 1 and fourteen (14) candidates registered for Unit 2 in this examination. All candidates who registered sat both papers in both units.

Performance in all papers was quite poor.

The examining team is still of the opinion that improvement in performance would result if the units were divided along the electrical/electronics specialization.

This arrangement, the examiners believe, would facilitate:

1. Better selection of text along electrical and electronic lines.
2. Better teaching since students would benefit from the expertise of teachers who are trained in the various specialties. It is evident from the performance of students that teachers are concentrating on their area of specialization and perhaps neglecting other areas.
3. Candidate concentration on one specialization before moving to the next.

UNIT 1

PAPER 01

SHORT ANSWERS

Candidates were required to do all questions from this paper which accounted for 90 marks. The range of the marks scored by candidates was zero (0) to forty-four (44) with a mean score of 28.4. Of the 25 candidates, four (4) scored in the 40 – 50 range, five (5) scored in the 30 – 39 range, eight (8) scored in the 20 – 29 range. The remaining eight (8) candidates scored below 20 marks.

MODULE 1

DC CIRCUIT THEORY (Questions 1-5)

Candidates were required to use fundamental laws and simple theory to solve problems on simple DC circuits. From a possible 30 marks, the highest score was 24 with a mean score of 14.4. Five (5) candidates scored in the 20 – 30 range, eight (8) scored in the 15 – 19 range, six (6) scored in the 10 – 14 range and the remaining six (6) candidates scored below 10 marks.

COMMENTS ON QUESTIONS

Question 1

Three (3) candidates were able to provide perfect responses (5-6 marks) to this question whereas 13 candidates scored in the 3 – 4 mark range, seven (7) scored between 1 and 2 marks and three (3) scored zero from a possible six (6) marks. Most candidates experienced difficulties identifying which material displayed an increase or decrease in resistance when exposed to a rise in temperature.

Question 2

Two (2) candidates provided perfect (5-6 marks) responses to this question whereas seven (7) scored in the 3-4 mark range, nine (9) scored in the 1-2 mark range and the remaining seven (7) scored zero (0)from a possible six marks. Many candidates knew how to calculate the PD across the capacitors but were unable to determine the charge. Candidates could not identify capacitors which are suitable for HV operations.

Question 3

Four (4) candidates provided perfect (5-6 marks) responses to this question whereas nine (9) scored in the 3-4 mark range, six (6) scored between 1 and 2 marks and five (5) either scored zero (0) or did not provide a response. Most candidates could not identify physical factors which determine inductance.

Question 4

Four (4) candidates provided perfect (5-6 marks) responses, eleven (11) scored in the 3-4 mark range, six (6) scored between 1 and 2 marks and the remaining four (4) either scored zero (0) or did not provide a response. Part (b) of the questions required knowledge of how to calculate parallel impedance which is not covered in Unit 1.

Question 5

Twelve (12) candidates provided perfect (5-6 marks) responses whereas eleven (11) scored in the 3-4 mark range, one (1) candidate scored 1 and another scored zero (0). In general, the candidates understood Kirchoff's Law.

MODULE 2

ANALOGUE ELECTRONICS AND COMMUNICATIONS (Questions 6 - 10)

Basic analogue and electronics and communications concepts were covered in this module. This module proved to be extremely challenging for candidates. The highest score was 10 from a possible 30 points with a mean score of 4.68. One (1) candidate scored in the 10 – 14 range and the remaining 24 scored below 10 points including eight candidates who scored below six points.

COMMENTS ON QUESTIONS

Question 6

Two (2) candidates provided perfect (5-6 marks) responses whereas eight (8) candidates scored in the 3-4 mark range, seven (7) scored between 1 and 2 marks and eight (8) candidate either scored zero or did not provide a response. Only a few candidates were conversant with the bridge rectifier. Most candidates did not know the function of the bleeder resistor.

Question 7

This question proved difficult for most candidates. Two (2) candidates scored in the 3-4 mark range, eight (8) scored in the 1-2 range whereas the remaining 15 candidates scored zero (0) from a possible six marks. Many candidates were not conversant with modulation and how to determine modulation factor.

Question 8

This question also proved extremely difficult for most candidates. Three (3) candidates scored in the 1-2 mark range and the remaining 22 either scored zero (0) or did not respond to the question. The majority of the candidates was unable to identify the configuration of the amplifier circuit and could not calculate the base and emitter voltages.

Question 9

This question also proved quite difficult for most candidates. Ten (10) candidates scored in the 1-2 mark range and the remaining 15 either scored zero (0) or did not respond to the question. Candidates shad limited knowledge about operational amplifiers.

Question 10

This question also proved extremely difficult for most candidates. None provided perfect (5-6 marks) responses, three (3) scored in the 3-4 mark range, 16 scored between 1 and 2 marks from a possible six marks with the remaining six (6) candidates scoring zero. Most candidates were able to identify applications of the light emitting diode but were unable to explain its operations.

MODULE 3

INTRODUCTION TO POWER SYSTEMS (Questions 11-15)

This module was not as challenging as the previous module. From a possible 30 points, the highest score was above 15 and the lowest was zero (0) with a mean score of 6.76 points. Of the 25 candidates, seven (7) scored in the 10-14 range, eight (8) scored between 6-9 points and the remaining 10 scored below 6 points. This reveals that either the candidates were ill prepared for this module or that they did not have enough time to complete it in a satisfactory manner.

COMMENTS ON QUESTIONS

Question 11

Only one candidate provided a perfect (5-6 marks) response whereas five (5) candidates scored in the 3-4 mark range. Ten (10) scored between 1 and 2 marks and nine (9) scored zero from a possible six marks. Most candidates were able to state Lenz's law and some were able to give the formula to calculate the average emf induced in the coil.

Question 12

This question proved extremely difficult for most candidates. None provided a perfect (5-6 marks) response, six (6) scored in the 1-2 mark range. The remaining 19 candidates either scored zero or did not provide a response to this question. Candidates were unable draw the magnetization curve and could not identify the saturation point.

Question 13

This question proved extremely difficult for most candidates. None provided a perfect (5-6 marks) response, one (1) scored in the 3-4 mark range, eleven (11) scored in the 1-2 mark range and the remaining 13 candidates either scored zero or did not provide a response to this question. Most candidates were able to sketch the characteristics of the cartridge fuse but were not able to outline the operation of the fuse.

Question 14

This was a good question for most candidates. One (1) scored in 5 marks, whereas eight (8) scored in the 3-4 mark range sixteen (16) scored between 1 and 2 marks from a possible six marks. One candidate did not respond to the question. Most candidates were able to identify the advantages of digital over analogue. Many candidates were unable to describe the modulation process.

Question 15

This was a good question for most candidates. One (1) scored in 6 marks, whereas four (4) scored in the 3-4 mark range sixteen (16) scored between 1 and 2 marks from a possible six marks. Four candidates either scored zero (0) or did not respond to the question. Candidates were able to state the function of computers and give the purpose of the demodulator.

UNIT 1

PAPER 02

All twenty-five (25) candidates sat this paper. They were required to do six questions from this paper which accounts for 150 marks. Questions 1, 4 and 7 are compulsory and value 30 marks each. Candidates were required to select one of the remaining two questions in each module for a value of 20 marks each. Most candidates attempted the required two questions from each module.

The range of the marks obtained was thirteen (13) to a high of sixty-nine (69) and the mean score was 36.96. Five (5) candidates scored in the 50-69 range, eleven (11) scored in the 30-49 range and the remaining nine (9) candidates scored in the 10-29 range.

MODULE 1

DC CIRCUIT THEORY (Questions 1-3)

Candidates were required to do question one and one other from this section. From a possible score of 50 from the module, the highest score was 21, the lowest was zero and the mean score was 11.16. Three (3) candidates scored in the 20-29 range, 13 scored in the 10-19 range and nine (9) scored in the 1-9 range.

COMMENTS ON QUESTIONS

Question 1

This question tested the candidate's knowledge of Kirchoff's law and the use of Superposition theorem. The highest score obtained was 13 from a possible 30 marks. Three (3) candidates scored in the 10*15 mark range whereas 11 candidates scored in the 5-9 range. All other candidates scored below four (4) marks including two (2) candidates who scored zero. This question though basic proved challenging for most candidates. Most knew the conditions for maximum power transfer but were unable to calculate current through a resistor using the Superposition theorem.

Question 2

This question tested candidates' knowledge of capacitors, capacitance and time constant. The majority of the candidates (19) selected this question and scored a high of 12 and a low of 2 marks from a possible 20 marks. One candidate scored 12 marks whereas the remaining 18 scored below 10 marks. Most candidates could define capacitance and state its unit. They were also able to determine time constant and initial charging current but they experienced difficulties with the remaining parts of the question.

Question 3

This question tested the candidates' knowledge of inductors, self inductance and mutual inductance. Only six (6) candidates chose this question and scored a high of 11 marks and a low of three (3) marks from a possible 20 marks. One candidate scored 11 marks whereas the remaining 5 scored below 10 marks. In general, this question was not well done by candidates. However, they seemed to understand the concept of mutual inductance and how to determine time constant in an inductive circuit.

MODULE 2

ANALOGUE ELECTRONICS AND COMMUNICATIONS (Questions 4-6)

Candidates were required to do Question four and one other from this section. From a possible score of 50 from the module, the highest score was 32, the lowest was zero and the mean score was 13.32. Two (2) candidates scored in the 30-50 range, 3 candidates scored in the 20-29 range, six (6) scored in the 1-9 range and one (1) candidate scored zero.

COMMENTS ON QUESTIONS

Question 4

This question tested the candidates' knowledge of wave shaping circuits, oscillators, semiconductors and Zener Diode. All candidates were required to answer this question. The highest score was 20 from a possible 30 marks. Only one candidate was able to provide a good response (20-30 marks), and only three (3) scored between 15 and 19 marks. Three (3) candidates scored between 10 and 14 marks, 13 scored between 5 and 9 marks, 5 scored between 1 and 4 marks, while one scored zero. Candidates experienced difficulties with waving, shaping circuits but were conversant with charge carries in semiconductor materials.

Question 5

This question tested the candidates' knowledge of transistor biasing circuits, amplifier gain and modulation. Seven (7) candidates attempted this question and scored a high of 4 from a possible 20 marks. It is evident that candidates are unfamiliar with transistor biasing circuits and amplifier circuits in general.

Question 6

This question focused on amplifiers, receiver sensitivity and wave propagation. Eighteen (18) candidates attempted this question and scored a high of 14 from a possible 20 marks. Four candidates scored in the 10-15 range whereas seven scored in the 5-9 range, five scored between 1-4 marks, while one (1) scored zero. Most candidates are unfamiliar with frequency response curves and did not understand the concept of sensitivity of receivers.

MODULE 3

INTRODUCTION TO ELECTRICAL POWER SYSTEMS (Questions 7-9)

Candidates were required to do question seven and one other from this section. From a possible score of 50 from the module, the highest score was 26, the lowest was 2 and the mean score was 12.48 Five (5) candidates scored in the 20-29 range, 11 scored in the 10-19 range and 8 scored in the 1-9 range.

COMMENTS ON QUESTIONS

Question 7

This question tested the candidates' knowledge of dc dynamo and its connection as a generator. In general, the performance on this question was average. The highest score was 20 marks. Four (4) candidates scored in the 15 and 20 mark range, six (6) scored in the 10-14 mark range, ten scored between 5 and 9 marks and five scored between 1 and 4 marks. Candidates were able to label the parts of the dc machine but experienced difficulties in placing the components in functional groups. Most candidates were unable to draw the circuit for the long shunt configuration.

Question 8

This question focused on overload relays. Two (2) candidates attempted this question and scored 6 and 2 marks respectively from a possible 20 marks. It is evident that all candidates were unfamiliar with overload relays

Question 9

This question focused on electromagnetism, permeability, reluctance and magneto motive force (mmf). Twenty-three 23 candidates attempted this question and scored a high of 11 from a possible 20 marks. One (1) candidate scored in the 10-14 range whereas eight (8) scored in the 5-9 range, 11 scored between 1 and 4 marks, while three either scored zero or did not provide a response that was worthy of grading. Most candidates knew how to draw the diagram that explains the effect of a current carrying conductor in a magnetic field. Most experienced difficulties with the B-H curve.

UNIT 2

PAPER 01

SHORT ANSWERS

Candidates were required to do all questions from this paper which accounts for 90 marks. The range of the marks scored by candidates was from a low of ten (10) to a high of forty-two (42) with an average score of 29.5. Of the 14 candidates, one (1) scored in the 40 – 49 range, six (6) candidates scored in the 30 – 39 range, six (6) candidates scored in the 20 – 29 range and one (1) scored in the 10 – 19 range.

MODULE 1

AC CIRCUIT THEORY (Questions 1-5)

Candidates were required to use fundamental laws and simple theory to solve simple AC circuits. This module proved challenging for candidates as evidenced by a low average score of 9.36 form a possible 30 marks. The highest score was 19 and the lowest score was three marks. Two (2) candidates scored in the 15 – 19 range, two (2) scored in the 10 – 14 range, nine (9) scored in the 5 – 9 range and one (1) candidate scored three marks.

COMMENTS ON QUESTIONS

Question 1

This question tested the candidates' knowledge of RLC circuits. One (1) candidate provided an excellent response (six marks), however it was quite challenging to all other candidates since two of them scored one (1) and the remaining 11 candidates either scored zero or did not respond to the question.

Question 2

Candidates were asked to define capacitance and capacitive reactance and to identify the difference between a high pass and a low pass filter. One candidate provided an excellent response (six marks), however it was quite challenging to all other candidates since only four (4) scored in the 3-4 mark range and eight (8) scored in the 1-2 range and one (1) scored zero. Most candidates were able to define terms but were unable to identify the difference between high and low pass filters.

Question 3

Given a RLC circuit, candidates were required to calculate resonant frequency and current. Most candidates responded well to this question, however, they experienced difficulties determining resonant frequency. Two (2) candidates provided perfect responses (6 marks), eleven (11) scored in the 3-4 mark range and one (1) scored 2 marks.

Question 4

Candidates were asked to define the term 'frequency response' and to determine the cutoff frequency of a first order low pass filter. Seven candidates were able to define the term, however most experienced difficulties with calculating cutoff frequency. There (3) scored 4 marks, five (5) scored 1 mark and the remaining six (6) candidates either scored zero or did not provide a response for the question.

Question 5

Candidates were asked to explain the term 'power dissipated' and 'impedance match' and to draw diagrams of 'T' and π. Type low pass filters. Most candidates were able to explain the term 'power dissipated' but could not explain 'impedance match'. Several of them were able to draw the diagrams requested. Two (2) scored in the 3-4 mark range, nine (9) scored in the 1-2 mark range and two (2) scored zero.

MODULE 2

DIGITAL ELECTRONICS & DATA COMMUNICATIONS (Questions 6-10)

Basic analogue and electronics and communications concepts were covered in this module. With a mean score of 9.45 from a possible 30 marks it is evident that the module was generally not understood by most candidates. The highest score was 15 and the lowest score was one mark. Two (2) candidates scored in the 15 – 19 range, five (5) scored in the 10 – 14 range, six (6) scored in the 5 – 9 range and one (1) candidate scored one mark.

COMMENTS ON THE QUESTIONS

Question 6

Candidates were asked to explain 'fixed commutation' and 'latching current'. They were asked to differentiate between the enhancement and depletion modes of the MOSFET. No candidate scored marks for this question.

Question 7

Candidates were asked to use a truth table to prove two quantities different. Candidates did not respond well to this question. Three (3) candidates provided perfect responses (scored in the 5-6 range) whereas one (1) scored in the 3-4 mark range, seven (7) scored in the 1-2 mark range and three (3) either scored zero or did not attempt the question.

Question 8

Candidates were required to state the function of a clock circuit in a logic system and to explain what is meant by asynchronous circuit. This question proved difficult for most candidates. Seven (7) scored in the 1-2 mark range and seven (7) either scored zero or did not attempt the question.

Question 9

This question required candidates to explain the function of A/D and D/A convertors and to define D/A resolution. This question was understood by most candidates. Two (2) candidates provided perfect responses (scored in the 5-6 range), eight (8) scored 4 marks each, one (1) scored 2 marks and two (2) did not respond to the question.

Question 10

Candidates were required to state the characteristics of an ideal switch and to draw symbols and state Boolean expression for several gates. Most candidates understood this question. Two (2) candidates provided perfect responses (scored in the 5-6 range), eight (8) scored in the 3-4 mark range and four (4) scored in the 1-2 mark range.

MODULE 3

INTRODUCTION TO AC MACHINES (Questions 11-15)

This constitutes the best module for candidates. An average sore of 10.36 from a possible 30 mark was achieved. The highest score was 20 and the lowest score was 6 marks. One (1) candidate scored 20, eight (8) scored in the 10-14 range and five (5) scored in the 5-9 range.

COMMENTS ON THE QUESTIONS

Question 11

This question tested candidates' knowledge of transformers. Most candidates performed well on this question. Three (3) provided perfect responses (scored in the 5-6 marks range), ten (10) scored in the 3-4 range and one (1) scored zero.

Question 12

This question tested the candidates' understanding of voltage regulation. It is evident that the candidates lacked knowledge and understanding of this concept. Only one (1) candidate scored a perfect six points, six (6) scored in the 1-2 range, whereas seven (7) either scored zero or did not attempt to answer this question.

Question 13

This question tested the candidates' understanding of synchronous impedance in an ASC dynamo. Candidates were not conversant with this concept. Five (5) scored in the 3-4 mark range, three (3) scored in the 1-2 mark range and six (6) either scored zero or did not attempt the question.

Question 14

Candidates were asked to explain the construction of a rotor for an induction motor and to identify two uses of the induction motor. Interestingly, candidates did not perform well on this question. One (1) candidate scored 5, four (4) scored in the 3-4 mark range, six (6) scored in the 1-+2 mark range and three (3) scored zero.

Question 15

Candidates were required to define the terms 'rotor speed' and 'slip' and to draw a typical torque-slip characteristic curve for the induction motor. Candidates did not perform well on this question. Most did not know how to calculate slip and experienced difficulties defining rotor speed. Most were not able to draw the torque-slip characteristic curve. Seven (7) scored in the 3-4 range, six (6) scored in the 1-2 range and one (1) scored zero.

UNIT 2

PAPER 02

Candidates were required to do six questions from this paper which accounted for 150 marks. Questions 1, 4 and 7 are compulsory and value 30 marks each. Candidates are required to select one of the remaining two questions in each module for a value of 20 marks each. All 14 candidates attempted the required two questions from each module.

The marks obtained by candidates ranged from nineteen (19) to sixty-seven (67) with a mean score of 44.21. Six (6) candidates scored in the 50-69 range, six (6) scored in the 30-49 range, and the remaining two (2) candidates scored in the 15-29 range.

MODULE 1

AC CIRCUIT THEORY (Questions 1-3)

Candidates were required to do Question 1 and one other from this section. From a possible score of 50 for this module, the highest score was 35 and the lowest was four (4) marks with an average score of 23.38. Two (2) candidates scored in the 30 – 39 range, seven (7) candidates scored in the 20-29 range, and four (4) candidates scored in the 10 – 19 range .

COMMENTS ON QUESTIONS

Question 1

This question tested the candidate's knowledge of AC waveform, specifically the definition of period, amplitude and rms valve. They were required to sketch the waveform and identify various areas of the plot. Candidates were also required to draw an equivalent circuit for a coil, and its phasor diagram, then calculate various circuit parameters. Most have general understanding about the waveform but were unable to draw the phasor diagram and could not calculate the capacitance needed to make the phase angle zero. One candidate scored the maximum score of 30 marks. Five (5) candidates in the 20-29 marks range, seven (7) candidates scored in the 10-19 marks range, whereas one candidate scored 4 marks.

Question 2

This question tested candidates' knowledge of rectangular and polar notations. Given a LRC circuit, candidates were required to determine branch currents and phase angle between supply current and voltage. They were also required to draw a phasor diagram for LRC circuit assuming pure reactances. Eight (8) candidates attempted the question and one scored a maximum of 14 marks from a possible 20 marks. Four candidates scored in the 10-15 marks range, three (3) scored between 2 and 8 marks and one scored zero. It is apparent that candidates were unaware of rectangular and polar notations and how to draw phasor representation.

Question 3

This question tested the candidates' knowledge of filters, particularly the band pass filter. Six (6) candidates attempted this question. The maximum score was seven (7) marks from a possible 20 marks. It is evident that this question was challenging for all candidates that attempted it since all scored below 10 marks. Most candidates were unable to calculate resonant frequency and bandwidth.

MODULE 2

DIGITAL ELECTRONICS AND DATA COMMUNICATIONS (Questions 4-6)

Candidates were required to do Question four and one other from this section. From a possible score of 50 for this module, the highest score was 24 and the lowest was three (3) Three (3) candidates scored in the 20 – 29 range, five (5) scored in the 10-19 range, and six (6) scored in the 1 – 9 range.

COMMENTS ON QUESTIONS

Question 4

The candidates were required to explain the operation of a thyristor and explain the function of a multivibrator. The marks for this question ranged from 0-11 with a mean of 3.5 marks from a possible 30 marks. Three (3) candidates scored in the 10-19 range, five (5) scored in the 1-9 range and six (6) either scored zero or did not respond to the question. The results revealed that all candidates lacked understanding in these areas.

Question 5

This question tested the candidates' knowledge of memory systems and the operation of shift registers. Only two (2) candidates attempted this question and scored 6 and 8 marks respectively from a possible 20 marks. It is evident that this question was quite unpopular and that the candidates that attempted it were not familiar with the topic.

Question 6

This question tested the knowledge of counters and logic gates. Twelve (12) candidates attempted this question it. The highest score obtained was sixteen (16) marks from a possible 20 marks. One candidate scored 16, whereas, six (6) candidates scored in the 10-15 range and five (5) scored in the 1-9 range. This topic was widely known by most candidates. However none was able to describe the operation of counters and develop a truth table for a binary counter with three inputs.

MODULE 3

INTRODUCTION TO AC MACHINES (Questions 7-9)

Candidates were required to do question seven and one other from this section. From a possible score of 50 marks for this module, the scores ranged from 1 to 14 with an average of 8.36. Six (6) candidates scored in the 10-19 range, whereas the remaining eight (8) scored in the 1-9 range.

COMMENTS ON QUESTIONS

Question 7

This question focused on the synchronous motor. Candidates were required to label the parts of a pole of a synchronous dynamo, outline the purpose of the damper winding, outline the effects of excitation on armature reaction, determine shift in electrical degrees given the number of poles and mechanical shifts and to determine speed of a synchronous motor when given the number of poles and the frequency of the supply voltage. From a possible 30 marks, the scores ranged from 0-7 marks with six (6) candidates either scoring zero or not attempting the question. It is evident that the candidates lacked understanding of the synchronous motor and were unable to calculate speed.

Question 8

This question tested candidates' knowledge of single phase induction motors and required them to sketch load speed characteristics and to list uses of this motor. Given starting and running windings currents, candidates were required to calculate the locked rotor current and power factor. No candidate attempted this question which is an indication that they did not cover this topic.

Question 9

This question focused on the equivalent circuit for a practical transformer connected to a load. Candidates were required to calculate currents, internal impedances, voltage drops and induced voltages. All candidates attempted this question but the maximum score was only 10 marks from a possible 20 marks. Two (2) candidates scored 10 marks whereas eight (8) candidates scored in the 5-9 range, three (3) scored between 1 and 4 marks and one (1) scored zero. In general, this question was quite challenging for the candidates. While some could draw the equivalent circuit fro the transformer, most could not perform the calculation required to find currents, impedances and voltages.

SCHOOL BASED ASSESSMENT

All SBA from Trinidad were evaluated and reported on during the first marking session, however, a number of late submissions for the rest of the region (ROR) were evaluated during this session. The comments made on the first submission holds true for those evaluated in this session.