CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION MAY/JUNE 2007

ELECTRICAL & ELECTRONIC TECHNOLOGY

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GENERAL COMMENTS

Sixty-one candidates registered for Unit 1 and 61 candidates registered for Unit 2 in this examination. All candidates who registered for Unit 1 sat Paper 02, whereas 59 sat Paper 01. All 61 candidates who registered for Unit 2 sat both Papers 01 and 02.

This is the second time which the revised syllabus is being tested with candidates sitting two papers in Units 1 & 2. Approximately the same number of candidates sat the examination when compared to last year; however the numbers were evenly spread across the units. As in previous years, the performance is quite poor.

The examiners are of the opinion that performance would be improved if candidates were given a booklet of formulae to be used in the examination. Providing formula booklets for candidates will not compromise the quality of examination since the paper setting exercise would take this into consideration when setting papers.

DETAILED COMMENTS

UNIT 1

PAPER 01

This paper in which all questions were compulsory, accounted for a total of 90 marks. The range of marks scored by candidates was 0 – 56. One candidate scored above 50 per cent, whereas six candidates (10 per cent) scored in the 40 – 50 per cent range. Thirty-four candidates (58 per cent) scored in the 20 – 39 range. The remaining 18 candidates (31 per cent) scored below 20 marks.

MODULE 1

DC Circuit Theory

Candidates were required to use fundamental laws and simple theory to solve simple DC circuits. From a possible 30 marks, the highest score was 26 and three candidates scored zero. Approximately 25 per cent of the candidates scored 50 per cent or above on Module 1. Six candidates scored in the 21 – 30 range, nine scored in the 15 -20 range, fourteen (16 per cent) scored in the 10 – 14 range and the remaining 28 candidates scored below 10 marks.

Question 1

Twenty-two per cent of the candidates were able to provide perfect responses (5 – 6 marks) whereas 50 per cent scored in the 0 – 2 marks range from a possible six marks. Candidates experienced difficulties in calculating mesh currents.

Question 2

Sixteen per cent of the candidates were able to provide perfect responses whereas 46 per cent scored between 0 and 2 marks from a possible six marks. Most candidates experienced difficulties with the second section of the question where they were asked to calculate voltage across a capacitor.

Question 3

Fourteen per cent of the candidates were able to provide perfect responses whereas 66 percent scored between 0 and 2 marks from a possible six marks. Most candidates experienced difficulties with the second section of the question where they were asked to calculate time constant.

Question 4

Thirty three per cent of the candidates were able to provide perfect responses whereas 20 per cent scored between 0 and 2 marks from a possible six marks. Few candidates had difficulties with this question.

Question 5

Three per cent of the candidates were able to provide perfect responses whereas 88 per cent scored between 0 and 2 marks from a possible six marks. Most candidates experienced difficulties with this question. They were unable to manipulate the temperature coefficient formula.

MODULE 2

Analogue Electronics & Communications

Basic analogue and electronics and communications concepts were covered in this Module. This Module proved to be somewhat challenging. The highest score was 20 and five candidates scored zero from a possible 30 marks. Of the 59 candidates, none scored in the 21 and above range. Six scored in the 15 – 20 range, 12 scored in the 10 – 14 range and the remaining 41 scored below 10 points.

Question 6

Five per cent of the candidates were able to provide perfect responses whereas 89 per cent scored between 0 and 2 marks from a possible six marks. Most candidates experienced difficulties with all parts of the question. They do not understand semiconductor doping.

Question 7

None of the candidates were able to provide perfect responses, five per cent scored between 1 and 2 marks while 66 per cent either did not attempt the question or scored zero from a possible six marks. A few candidates were able to explain how the clipper works but were unable to sketch the out put wave.

Question 8

Thirteen per cent of the candidates were able to provide perfect responses, 33 per cent scored between 1 and 2 marks while 33 per cent either did not attempt the question or scored zero from a possible six marks. It appears that candidates were not familiar with the characteristics curves of the transistor.

Question 9

Twenty-one per cent of the candidates were able to provide perfect responses, 23 per cent scored between 1 and 2 marks while 23 per cent either did not attempt the question or scored zero from a possible six mark. The diagram of the summing circuit was widely known, however most candidates were unable to provide and use the formula to determine the output.

Question 10

None of the candidates were able to provide perfect responses, 15 per cent scored between 1 and 2 marks while 62 per cent either did not attempt the question or scored zero from a possible six marks. Candidates were not familiar with ground wave propagation.

MODULE 3

Introduction to Power Systems

This was the most challenging of the three Modules. The highest score was 17 and seven candidates scored zero from a possible 30 marks. Of the 59 candidates, five 5 scored in the 15 – 20 range, 12 scored in the 10 – 14 range and the remaining 42 scored below 10 marks. Most candidates were ill prepared for this Module.

Question 11

Only three candidates (5 per cent) were able to provide near perfect responses, 33 per cent scored between 1 and 2 marks while 50 per cent either did not attempt the question or scored zero from a possible six marks. Candidates were unable to define magnetomotive and magnetizing force.

Question 12

None of the candidates were able to provide perfect responses, 25 per cent scored between 1 and 2 marks while 66 per cent either did not attempt the question or scored zero from a possible six marks. Most candidates were not familiar with DC machines and magnetization curves.

Question 13

Only one candidate was able to provide a near perfect response, 33 per cent scored between 1 and 2 marks while 26 per cent either did not attempt the question or scored zero from a possible six marks. Only a few candidates were able to identify where fuses and circuit breakers are located in a typical electrical system.

Question 14

Only one candidate was able to provide a perfect response, 44 per cent scored between 1 and 2 marks while 41 per cent either did not attempt the question or scored zero from a possible six marks. Only a few candidates were able to identify where fuses and circuit breakers are located in a typical electrical system.

Question 15

Twenty-five per cent of the candidates were able to provide prefect responses, 33 per cent scored between 1 and 2 marks while 26 per cent either did not attempt the question or scored zero from a possible six marks. Most candidates were able to identify parts of the motor but were unable to explain their functions.

PAPER 02

Sixty-one 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 0 -78. Only Three candidates (5 per cent) scored in the 70 – 100 range. Nine candidates (15 per cent) scored in the 50 -69 range. Eighteen (18) candidates (30 per cent) scored in the 30 – 49 range, twenty three (38 per cent) scored in the 10 – 29 range. Only six candidates (10 per cent) scored below 10 marks.

MODULE 1

DC Circuit Theory

Candidates were required to do Question 1 and one other from this section. From a possible score of 50 from this module, the highest score was 40. Six candidates scored in the 31 – 50 range, seven candidates scored in the 20 – 30 range, 22 scored in the 10 – 19 range, 26 scored in the 1- 9 range and one candidate scored zero.

Question 1

Eleven per cent of the candidates were able to provide reasonable (16 – 20 marks), 25 per cent scored between 6 and 16 marks, 44 per cent scored between 1 and 5 marks, while 20 per cent either did not attempt the question or scored zero from a possible 30 marks. Generally, candidates understood Thevenin's circuit but were unable to calculate maximum power transfer.

Question 2

Seventy-three per cent of the candidates (45) chose this question. Of this number 6 per cent were able to provide excellent responses (16 – 20 marks), 31 per cent provided reasonable responses (10 – 15 marks), 47 per cent scored 5 – 9 marks, and 13 per cent scored between 1 and 4 marks. The remaining candidates (2 per cent) scored zero from a possible 20 marks. Many candidates were unable to calculate capacitance and the charge stored by the capacitor.

Question 3

Only 23 per cent of the candidates (15) chose this question. Of this number, one scored 11 and a second scored 6 marks. All others scored in the 1 – 5 mark range. In general, this question was not well done by candidates. Candidates have difficulties with inductance.

MODULE 2

Analogue Electronics & Communications

Candidates were required to do Question 4 and one other from this section. From a possible score of 50 from this Module, the highest score was 27. Four candidates scored in the 20 – 30 range, 21 scored in the 10 – 19 range, 26 scored in the 1 – 9 range and ten candidates scored zero.

Question 4

This question, though compulsory was attempted by 43 per cent of the candidates. The highest score was 18. Only two candidates were able to provide reasonable responses (16 – 20 marks), 23 per cent scored between 6 and 16 marks, another 23 per cent scored between 1 and 5 marks from a possible 30 marks. Fifteen candidates scored zero and 12 did not respond to the question. Candidates do not understand hybrid parameters.

Question 5

Fifty per cent of the candidates (30) chose this question and scored a high of 16 from a possible 20 marks. One candidate scored in the 16 – 20 mark range whereas 23 per cent provided reasonable responses (10 – 15 marks), 33 per cent scored 5 – 9 marks, and 33 per cent scored between 1 and 4 marks. The remaining candidates (5 per cent) scored 0 from a possible 20 marks. Parts (b) and (c) were widely known, however part (d) which questioned sensitivity of the superhetrodyne receiver, presented much difficulty for candidates.

Question 6

Twenty three candidates attempted this question and scored a high of 15 marks. Four candidates scored in the 10 – 15 range whereas 14 scored in the 1 – 9 range and five candidates scored zero. Most candidates were unable to draw a diagram of the Wein Bridge Oscillator and explain how it works.

MODULE 3

Introduction to Electrical Power Systems

Candidates were required to do Question 7 and one other from this section. From a possible score of 50 from this module, the highest score was 24. Seven candidates scored in the 20 – 30 range, 26 scored in the 10 – 19 range, 25 scored in the 1 – 9 range and three candidates scored zero.

Question 7

The response to this question was generally poor. The highest score was 12 marks. Only eight candidates (13 per cent) scored in the 10 – 15 range from a possible 30 marks. Thirty-eight scored below 10 marks and 14 candidates (23 per cent) scored zero or did not attempt the question. Candidates experienced difficulties in sketching the characteristics curves for various DC generator configurations.

Question 8

Thirty-seven candidates (61 per cent) attempted this question with the highest score being 12 from a possible 20 marks. Of this number, three scored zero, while 13 scored 10 or above marks. The remaining 23 candidates scored below 10 marks. It was evident that candidates were unfamiliar with the GPS and how it relates to SCADA.

Question 9

Twenty candidates (33 per cent) attempted this question. Of this number two scored zero. Only one candidate scored above 10 marks. Faraday's Law of magnetic induction was generally not known to the candidates.

UNIT 2

PAPER 01

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 six to a high of 67, of the 61 candidates, thirteen candidates scored in the 50 – 70 range, thirty six scored in the 30 – 49 range. Five (5) candidates scored in the 20 – 29 range. The remaining seven candidates scored below 20 marks.

MODULE 1

AC Circuit Theory

Candidates were required to use fundamental laws and simple theory to solve simple AC circuits. From a possible 30 marks, the highest score was 30 and the lowest 2 marks. Approximately sixty four per cent of the candidates (39) scored 50 per cent or above in this module. Sixteen candidates scored in the 21 – 30 range, 23 scored in the 15 – 20 range, nine scored in the 10 – 14 range and the remaining 13 candidates scored below 10 marks.

Question 1

Most candidates provided excellent responses to this question (35 scored in the 5 – 6 range from a possible 6 marks). Nine candidates either did not attempt or provide adequate responses for this question. Most candidates understood how to calculate the rms voltage and the frequency for an alternating voltage. A few candidates experienced difficulty labeling the graph (wave).

Question 2

Most candidates were able to provide good responses to this question (43 scored in the 5 – 6 range from a possible 6 marks). Only 11 candidates scored in the 0 – 2 mark range. Most candidates were able to determine the impedance of the circuit.

Question 3

Fourteen candidates provided adequate responses for this question (14 scored in the 5 – 6 range from a possible 6 marks). Sixty-six per cent of the candidates scored in the 0 – 2 range of which half of this number either scored zero or did not attempt the question. Most candidates were unable to convert the impedance to polar form.

Question 4

All candidates responded to this question of which 35 per cent of them were able to provide reasonable responses (9 scored in the 5 – 6 range from a possible 6 marks). Thirty-nine candidates scored in the 0 – 2 range. This number includes 11 who scored zero. Most candidates experienced difficulties in calculating the cut-off frequency of the filter.

Question 5

Although all candidates attempted this question, only 11 scored in the 5 – 6 range. Forty seven did not provide adequate responses. They scored in the 0 – 2 range which include nine who scored zero. Candidates experienced difficulties in calculating impedance of the circuit.

MODULE 2

Digital Electronics & Data Communications

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

Fourteen candidates scored above 50 per cent (15 marks) in this module. Six candidates scored in the 21 – 30 range, eight candidates scored in the 15 – 20 range, twenty-four scored in the 10 – 14 range and the remaining 23 candidates scored below 10 marks.

Question 6

This question tested the candidates understanding of Boolean algebra. All except two candidates responded to this question. Twenty-five per cent of the candidates (16) were able to provide excellent responses (scored in the 5 – 6 range from a possible 6 marks). Thirty- three candidates scored in the 0 – 2 range. This number includes 17 who scored zero.

Question 7

Only four candidates provided reasonable responses to this question (scored in the 4 – 5 range from a possible 6 marks). Thirty four (56 per cent) candidates either did not attempt or scored zero. It was evident that most candidate do not understand counter circuits.

Question 8

All except three candidates responded to this question. Twenty three per cent of the candidates (14) were able to provide excellent responses (scored in the 5 – 6 range from a possible 6 marks). Twenty-eight candidates scored in the 0 – 2 range. This number includes nine candidates who scored zero. Many candidates experienced difficulties with assigning parity bits.

Question 9

This question tested the understanding of Logic gates. It is evident that most candidates did not understand truth tables. All except two candidates responded to this question. Forty-one per cent of the candidates (25) were able to provide excellent responses (scored in the 5 – 6 range from a possible 6 marks). Seventeen candidates scored in the 0 – 2 range. This number includes five candidates who scored zero.

Question 10

This question tested the understanding of digital to analogue converters. It is evident that most candidates were not familiar with this topic. Only five candidates provided excellent responses to this question (scored in the 5 – 6 range from a possible 6 marks). Thirty-five candidates (57 per cent) either did not attempt or scored zero, while eight candidates scored in the 1 – 2 mark range.

MODULE 3

Introduction to AC Machines

This module posed significant challenges to candidates. Only eight candidates scored above 50 per cent (15 marks) in this module. Another eight candidates scored in the 15 – 20 range, twenty five scored in the 10 – 14 range and the remaining 28 candidates scored below 10 marks.

Question 11

All candidates attempted this question.. Twenty-one per cent of the candidates (13) were able to provide excellent responses (scored in the 5 – 6 range from a possible 6 marks). Nineteen candidates scored in the 0 – 2 range. This number includes 11 candidates who scored zero. The majority of the candidates did not have a knowledge of or even understood autotransformers.

Question 12

This question tested the candidates' knowledge of AC machines. Candidates lacked knowledge and understanding of the concepts related to this topic. Only 13 candidates scored points and nine did not attempt to answer this question. Two candidates scored 4 marks where as 11 scored in the 1 – 2 range.

Question 13

All except three candidates responded to this question. Sixteen candidates (25 per cent) provided reasonable responses (scored in the 4 – 5 range from a possible 6 marks). Twenty nine candidates (48 per cent) scored in the 0 – 2 range of which 3 candidates scored zero for this question. Few candidates have knowledge of the slip vs torque characteristics of the induction motor.

Question 14

All except five candidates responded to this question of which only four candidates provided reasonable responses (scored in the 4 – 5 range from a possible 6 marks). Fifty-two candidates (85 per cent) scored in the 0 – 2 range, half of this number (26) scored zero for this question. Most candidates were unable to explain the function of the windings of the wound rotor induction motor.

Question 15

All except five candidates responded to this question. Seventeen candidates provided excellent responses (scored in the 5 – 6 range from a possible 6 marks). Nineteen candidates (31 per cent) scored in the 0 – 2 range of which three scored zero. Many candidates were unable to complete the equivalent circuit as required.

PAPER 02

Candidates 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 are required to select on 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 marks obtained by candidates ranged from 11 – 82. Six candidates scored in the 70 – 100 range. Sixteen candidates scored in the 50 – 69 range, twenty-five scored in the 30 – 49 range, and the remaining thirteen candidates scored in the 0 – 29 range.

MODULE 1

AC Circuit Theory (Question 1 – 3)

Candidates were required to do question one and one other from this section. From a possible score of 50 from this module, the highest scored was thirty nine (39) and the lowest was two (2) marks. Three (3) candidates scored in the 31 – 50 range, Eleven (11) candidates scored in the 20 – 30 range, 31 scored in the 10 – 19 range, 16 scored in the 1 – 9 range.

Question 1

This question tested candidates' knowledge of RLC circuits. Most could explain the terms apparent, active and reactive power. All candidates attempted this question, however, calculations and manipulation of formulae were major challenges for many of them. Three candidates provided excellent responses for this question (21 – 30 marks range) with a maximum score of 22 marks. Four candidates were able to provide reasonable responses (16 – 20 marks), 54 per cent of the candidates (33) scored between 6 and 16 marks, 19 candidates (31 per cent) scored between 1 and 5 marks, while two candidates scored zero from a possible 30 marks.

Question 2

This question tested the candidates' knowledge and understanding of waveform analysis. Sixteen candidates (26 per cent) chose this question and scored a high14 marks for a possible 20 marks. Three candidates provided reasonable responses (10 – 15 marks), seven candidates scored in the 1 – 4 range, and the remaining four candidates scored zero. Several that candidates experienced difficulties with all aspects of this question.

Question 3

This question tested the candidates' knowledge of resonance and how to determine Q Factor in RLC Circuits. Seventy-five per cent of the candidates (46) chose this question and scored a high of 17 marks from a possible 20 marks. Of this number two candidates (4 per cent) was able to provide excellent responses (16 – 20 mark range), 22 per cent (10 candidates) provided reasonable responses (10 – 15 mark range), 22 candidates (48 per cent) scored in the 5 – 9 marks range, and seven candidates scored between 1 and 4 marks. The remaining 5 candidates (11 per cent) scored zero.

MODULE 2

Digital Electronics and Data Communication

Candidates were required to do Question 4 and one other from this section. From a possible score of 50 from this module, the highest score was 42 and the lowest was three. Six candidates (10 per cent) scored in the 31 – 50 range, 15 candidates (25 per cent) scored in the 20 – 30 range, 30 candidates (49 per cent) scored in the 10 – 19 range, and 10 candidates (16 per cent) scored in the 1 – 9 range.

Question 4

The candidates were required to construct truth table and simplify a logic circuit using Boolean algebra. Seven candidates (11 per cent) scored in the 20 – 30 range, twenty candidates (33 per cent) scored in the 10 – 19 range, whereas 30 candidates (49 per cent) scored in the 1 – 9 range, two scored zero and two did not respond to the question. Most candidates were unable to derive the truth table and experienced difficulties in simplifying the Boolean expression.

Question 6

Forty three candidates (67 per cent) attempted this question and scored in the range 1 – 20. Four candidates scored in the 15 – 20 range, twelve scored in the 10 – 14 range whereas twenty seven scored in the 1 – 9 range. Most candidates could differentiate between the full duplex, half duplex and simplex communications systems but were unable to explain what was meant by FSK and PSK. Most candidates did not know the cause for loss of signal along a line and how to prevent this lost.

MODULE 2

Introduction to AC Machines

Candidates were required to do Question 7 and one other from this section. From a possible score of 50 marks from this module, the marks ranged from 0 to 35. Only one candidate scored above 30. Seven candidates scored in the 20 – 30 range, 26 scored in the 10 – 19 range, 26 scored in the 10 – 19 range, 25 scored in the 1 – 9 range and two candidates scored zero.

Question 7

This question focused on transformers and tested candidates' knowledge of related terms. Candidates were also required to draw the equivalent circuit of a transformer and calculate the various parameters for the device. From a possible 30 marks, the scores ranged 1 – 23. Two candidates scored in the 20 – 30 range, 17 scored in the 10 – 19 range, 40 scored in the 1 – 9 range, and two candidates did not respond to this question. Most candidates were able to draw the equivalent circuit and calculate the various parameters but were unable to explain the terms requested.

Question 8

This question required the candidate to focus on the synchronous dynamo by describing its construction details and sketching aspects of it. Candidates were also required to calculate motor speed when given certain parameters. Forty-seven candidates attempted this question and scored a high of 14 from a possible 20 marks. Four candidates scored in the 10 – 14 range, 36 scored in the 1 – 9 range and seven candidates scored zero. Most candidates were able to compute the motor speed but were unable to sketch the circuits and diagrams required.

Question 9

This question focused on the split phase induction motor and required candidates to describe its features, sketch and label its diagram and compute parameters for this machine. Eight candidates attempted this question and scored a high of 8 marks from a possible 20 marks. Two candidates scored in the 1 – 9 range and six candidates scored zero. In general, this question was quite challenging for the candidates.

INTERNAL ASSESSMENT

There were 65 submissions for marking. Some centers submitted samples of candidates' projects as well as written reports whereas other submitted only written reports. The IAs were 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. Candidates should be encouraged to prepare their reports on projects in a timely manner.

RECOMMENDATIONS

1. All teachers should use the current CXC forms.

2. Candidates could benefit from closer supervision.