



**L-Università
ta' Malta**

**MATSEC
Examinations Board**



Examiners' Report

Advanced Computing

Main Session 2023

Examiners' Report (2023): Advanced Computing

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Advanced Computing was **148**, which is **15** candidates less than in 2022.

Table 1 shows the distribution of grades for the Main 2023 session of the examination

GRADE	A	B	C	D	E	F	ABS	TOTAL
NUMBER	19	21	40	32	11	19	6	148
% OF TOTAL	12.8	14.2	27.0	21.6	7.4	12.8	4.1	100

Table 1: Distribution of grades for AM Computing 2023 Main Session

B. GENERAL REMARKS

When compared to the previous year, there were significantly less failures (down to 12.8% from 23.9%) with more candidates achieving a grade D (up to 22.3% from 13.5%). There was also a notable increase of candidates who achieved an A grade, (up to 12.2% from 9.2%).

Candidates fared best in recall-style questions but struggled in more applicatory questions. Only 90 candidates (61%) of candidates opted to choose the programming question in Paper 2. The average score was 12.3/20 (62%). Given the importance of programming in computing, the three practical tasks which candidates have sat for in the run-up to this examination, and the fact that such questions form part of the exam paper every year, it was disappointing to not observe (a) a wider uptake of the question; and (b) better performance overall. Similarly, candidates scored an average of 1.4/5 (28%) in the compulsory programming question in Paper 1.

C. COMMENTS ON PAPER I AND PAPER II

Paper I

Question 1

Average Mark: 1.4 / 10

- 1a Many candidates mentioned inheritance. Some of them just wrote things, like Object Oriented Programming. There were a few who mentioned Polymorphism.
- 1b Very few candidates wrote private properties with getters and setters.

Question 2

Average Mark: 3.3 / 5

- 2a Most candidates answered this question correctly.
- 2b On average, candidates got this right but quite a few attempted to replace the while loop with a for-loop.
- 2c Very few candidates used the break statement. Many candidates modified the while loop.

Question 3

Average Mark: 4.0 / 5

- 3a Most candidates answered this question correctly.
- 3b Most candidates answered this question correctly.
- 3c Most candidates answered this question correctly.

Question 4

Average Mark: 1.7 / 5

- 4a Many candidates did not answer this correctly and instead answered referring to unrelated material.
- 4b Candidates who answered 4a correctly, tended to answer this question correctly.

Question 5

Average Mark: 3.8 / 5

- 5a Most candidates answered this question correctly.
- 5b Many candidates answered this incorrectly and seemed to be guessing between infix, postfix, etc.

Question 6

Average Mark: 3.9 / 5

- 6a Most candidates were able to answer this question correctly.
- 6b Many candidates were able to answer this question correctly.

Question 7

Average Mark: 3.0 / 5

- 7a Many candidates were able to answer this question correctly.
- 7b Many candidates answered this question correctly.

Question 8

Average Mark: 4.1 / 5

Most candidates answered this question correctly.

Question 9

Average Mark: 2.4 / 5

- 9a Many candidates struggled with this question and mentioned special purpose registers instead.
- 9b In general, only those who answered 9a correctly, successfully answered 9b.
- 9c Most candidates answered this question correctly.

Question 10

Average Mark: 4.1 / 5

10a Most candidates answered this question correctly.

10b Many candidates answered this correctly. However, a substantial number did not go into detail when drawing the list, opting instead to draw some boxes and arrows.

10c Most candidates answered this question correctly.

Question 11

Average Mark: 2.5 / 5

Candidates displayed a reasonable grasp of the principle of duality in Boolean algebra. However, there was some confusion about universal gates and their significance. When asked to apply Boolean algebra laws, candidates struggled to prove the given expression.

Question 12

Average Mark: 3.2 / 5

Most candidates showed a fair understanding of creating a truth table to identify input conditions resulting in a 0 output. However, performance was poor when attempting to write the equivalent Boolean expression for a given logic circuit. When it came to representing an expression using NAND gates, candidates performed reasonably well.

Question 13

Average Mark: 4.4 / 5

In this task, candidates displayed a fair understanding of the concepts related to computer architecture and assembly language. While some candidates struggled to provide a complete and precise definition of an assembly language instruction, they generally demonstrated comprehension of its purpose. In defining the fetch-execute cycle, candidates often provided accurate descriptions of the primary purpose of each phase. Similarly, in explaining the difference between general and special-purpose registers, candidates exhibited a decent understanding.

Question 14

Average Mark: 4.2 / 5

Almost all candidates were able to provide somewhat detailed descriptions of two instructions used in the program, indicating a reasonable grasp of assembly language concepts. However, there was some difficulty in determining the value stored in DX after program execution, and the explanation of cross-assemblers and their usage was limited.

Question 15

Average Mark: 4.6 / 5

Candidates performed well in this task overall. They demonstrated a good understanding of the term Local Area Network and were able to provide suitable topologies for a LAN, along with labelled diagrams for each. Additionally, when asked to list hardware and software items required for connecting the LAN to the internet, candidates showed a solid grasp of the necessary components.

Question 16

Average Mark: 4.2 / 5

Candidates showed mixed performance in this task, with some interchanging the definitions of parallel and serial data transmission. While many provided a benefit and a drawback of parallel transmission, their examples of its use varied. Additionally, some confusion was evident in identifying the transmission mode that allows data to travel in both directions but only one at a time.

Question 17

Average Mark: 4.2 / 5

Most candidates displayed a good understanding of the purpose of systems analysis. Many recognized the importance of this process in various domains, noting its role in designing effective and efficient solutions to complex problems. However, some respondents offered incomplete or vague explanations, while others mistakenly interchanged systems analysis with systems design, causing some confusion in their responses.

Question 18

Average Mark: 3.3 / 5

While candidates demonstrated an understanding of coherence as a guiding principle for decomposing a system into small parts, many struggled to identify the competing principle driving developers to keep the total number of parts small. Some provided partial explanations, while others misunderstood the concept. Candidates generally did well in listing the advantages of modular design, with many recognizing benefits such as ease of maintenance, reusability, and improved collaboration. In explaining the difference between bottom-up and top-down design, candidates displayed a reasonable understanding, though some answers lacked detail.

Question 19

Average Mark: 3.1 / 5

In this task, candidates showed a generally good understanding of the concept of an Entity Relationship diagram. They recognized that an ERD is a graphical representation of entities and their relationships in a database system. However, when tasked with creating an ERD for a wholesaler system, there was a wider range of performance. While some candidates created detailed diagrams, accurately capturing entities and cardinality constraints, others provided less comprehensive responses.

Question 20

Average Mark: 4.1 / 5

Most candidates showed a good understanding of and could name two advantages of Database Management Systems (DBMS). However, defining different types of keys proved to be a bit challenging, with varying accuracy and detail in responses. Candidates generally comprehended the importance of having some familiarity with file processing systems despite their limitations, although the depth of their explanations varied. In explaining components of Information Systems Architecture and their relationship to data, candidates displayed a reasonable understanding, with some providing clear explanations.

Paper II

Question 1

Average Mark: 15.5 / 20

This question was attempted by 74 candidates.

- 1a Most candidates answered this question correctly but a considerable number failed to mention inputs and outputs.
- 1b Most candidates answered this question correctly.
- 1c Most candidates answered this question correctly.
- 1d Most candidates answered this question correctly.
- 1e Most candidates answered this question correctly.

Question 2

Average Mark: 13.8 / 20

This question was attempted by 118 candidates.

- 2a Most answered this question correctly and demonstrated good reasoning.
- 2b Many answered this question correctly, but a considerable number did not mention ISR.
- 2c Many answered this question correctly.
- 2d Many answered correctly but marks were lost due to lack of detail in the answer.
- 2e Most candidates answered this question correctly.

Question 3

Average Mark: 11.9 / 20

This question was attempted by 58 candidates.

- 3a Most candidates failed to answer this question correctly and did not produce a table listing the steps involved in expressing the expression in RPN.
- 3b Most candidates answered this question correctly.
- 3c Most candidates answered this question correctly.
- 3d Most candidates answered this question correctly. Amongst those who did not, it seemed that they were struggling with the difference between interpreters and JIT compilers.

Question 4

Average Mark: 12.3 / 20

This question was attempted by 90 candidates.

- 4a Most candidates answered this question correctly.
- 4b Whilst many candidates successfully handled inheritance, many struggled with the notion of abstraction.
- 4c Most candidates answered this question correctly.
- 4d Most candidates answered this question correctly.
- 4e Many candidates answered this question correctly.
- 4f Whilst all candidates attempted to write something, many struggled to express OOP concepts clearly.
- 4g Most candidates failed to answer this correctly.

Question 5

Average Mark: 13.7 / 20

This question was attempted by 123 candidates.

Candidates performed well in explaining the OSI model. They provided comprehensive explanations of each layer with the aid of diagrams. However, there was a notable struggle to identify the layers responsible for error detection and flow control. They had a good grasp of the difference between non-persistent and 1-persistent CSMA/CD. However, when it came to naming and describing network switching protocols, their knowledge was somewhat limited. Lastly, candidates displayed a moderate understanding of the differences between MAC and IP addresses. Overall, while there was a strong performance in explaining the OSI model and CSMA/CD, there's a need for improvement in other networking concepts.

Question 6

Average Mark: 12.3 / 20

This question was attempted by 59 candidates.

The candidates' performance varied across different questions. While there was a relatively good understanding of drawing a truth table for a given Boolean function, some candidates had difficulty distinguishing between 1's complement and 2's complement representation. When it came to designing a full adder using half adder blocks, most candidates handled the first part well but struggled with creating the diagram using only half adders. When working on K-maps to minimize expressions for Gray code conversion, candidates demonstrated a reasonable understanding. However, drawing a logic circuit using these minimized expressions proved to be very challenging.

Question 7

Average Mark: 11 / 20

This question was attempted by 28 candidates.

Overall, candidates performed well in creating use case diagrams, but there was a notable mix-up with entity relationship diagrams. In the case of the design class diagram, there is room for improvement in avoiding redundancy and applying design patterns. Their understanding of testing types, particularly Alpha and Beta testing, needs strengthening, as well as the differences between White-box and Black-box testing.

Question 8

Average Mark: 15.2 / 20

This question was attempted by 114 candidates.

Most candidates had a good understanding of SQL commands, SQL query outputs, and some database concepts. However, there's room for improvement in areas like database normalization, second normal form, and a deeper understanding of the advantages and disadvantages of normalization, as well as the purpose and use of database packages and web-based solutions.

D. CONCLUDING COMMENTS

Whilst grades obtained by candidates are broadly comparable with previous sessions, examiners note with disappointment an elevated level of struggle with scenario-based and, more worryingly, programming tasks. It is indeed useful to be able to recall information about various topics, but going forward into careers in a knowledge economy, candidates need to focus more on their ability to apply knowledge to solve problems.

Whilst overall pass rates are largely comparable to previous years, it is our experience that candidates who eventually drop out of university courses do so because of their struggle with programming concepts. As noted in the general comments above, this remains a persistent issue with candidate cohorts. In this day and age, one should also recognise the fact that programming and algorithmic/computational thinking is a transferable skill that is crucial in all walks of life, not just for individuals who are intent on pursuing a career in computing.

Chairperson

Examination Panel 2023