L-Università ta' Malta

MATSEC
Examinations Board

Examiners' Report

Advanced Computing

Main Session 2024

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Advanced Computing was **146**, which is **2** candidates less than in 2023.

Table 1 shows the distribution of grades for the Main 2024 session of the examination

GRADE	A	B	C	D	E	F	ABS	TOTAL
NUMBER	14	21	43	24	20	19	5	146
% OF TOTAL	9.6	14.4	29.5	16.4	13.7	13.0	3.4	100

Table 1: Distribution of grades for AM Computing 2024 Main Session

B. GENERAL REMARKS

When compared to the previous year, it was observed that 19 candidates failed the subject, with a similar overall failure rate when considering the percentage view of the statistics (12.8% in 2023 vs 13% in 2024). The distribution of candidates who achieved Grades A,B,C was the same as in 2023 (53.5%), with candidates who obtained Grade D or E also remaining relatively constant (29.7% in 2023 vs 30.1% in 2024). However, a rightwards shift was noticed in both Grade groups. Less candidates obtained a Grade A (down to 9.6% from 12.2%), with balance shifting to Grade C which increased to 29.5% from 26.4% the previous year. Similarly, there was a decrease in candidates obtaining a Grade D (down to 17.1% from 22.3%) and a quasi equivalent increase in candidates achieving a Grade E (up to 13% from 7.4%). It is worth noting that the 9.6% of candidates obtaining a Grade A is more in line with previous years (9.2% in 2022, 7% in 2021 and 8% in 2020).

Whilst candidates fared reasonably well in recall-style questions and questions to which "template solutions" can be applied, they struggled in questions which required the understanding of a problem and subsequent selection of appropriate tools/techniques to solve that question. This year's results show that candidates are conversant with programming concepts (as evidenced by the 17.4/20 average mark for the programming question in Paper II). However, they mostly seem to only be able to apply these skills if guided at a very granular level.

C. COMMENTS ON PAPER I AND PAPER II

Paper I

Question 1

Average Mark: 4.4 / 5

Overall, candidates did very well on this question, showing a good understanding of binary numbers. Most could convert binary to decimal and add binary numbers correctly. A few candidates made small mistakes with calculations or understanding overflow, but most understood the concepts well.

Question 2

Average Mark: 4.3 / 5

Candidates did very well on this question. Most were able to draw the logic circuit diagram and create the truth table correctly, showing they understood how to use logic gates. Nearly all candidates wrote the correct Boolean function. There were only a few small mistakes with the truth tables or circuit diagrams, but overall, candidates showed they knew the material well.

Question 3

Average Mark: 2.7 / 5

In general candidates did well. A good number of candidates just stated their optimisation without writing the code. Whilst there were some very bad answers which demonstrated no understanding of basic programming concepts, these were in the minority.

Question 4

Average Mark: 2.0 / 5

Most candidates found this question challenging, with many struggling to correctly identify and explain the addressing modes used in each instruction. Some could identify a few addressing modes but didn't explain them well. Common mistakes included mixing up different types of addressing modes and confusion about how registers and memory addresses work. A few candidates did well, showing they understood the concepts.

Question 5

Average Mark: 3.1 / 5

Candidates showed a basic understanding of network cables and data transmission issues but struggled with some details. Many answered part a by describing the differences between shielded and unshielded twisted pair cables but did not always cover maximum length, speed, and EMI immunity thoroughly. In part b, while most identified EMI and noise as key sources of errors, their explanations of how these factors affect data transmission were often incomplete or lacked detail.

Question 6

Average Mark: 2.8 / 5

The majority of candidates generally understood the concepts of parity and checksum checks but struggled with providing detailed comparisons and real-world applications. In part a, many gave a basic comparison but lacked depth in explaining effectiveness. In part b, candidates often provided a relevant scenario for using parity checks but did not always justify their choice clearly. For part c, most candidates identified a limitation or consideration of parity checks, though some were vague.

Question 7

Average Mark: 3.7 / 5

Candidates showed a good understanding of the tasks involved in transitioning to a new CRM system and the different changeover techniques. They were generally able to identify key tasks needed before completing the changeover and described each changeover method accurately. However, some candidates provided more general responses rather than specific details or examples.

Question 8

Average Mark: 2.8 / 5

Some candidates had a hard time with the feasibility study. They were able to mention some general points about how the new system might fit with existing technology and what issues might arise, but they often missed important details. When discussing potential disruptions and how easy it would be for users to adapt, their answers were sometimes unclear or incomplete.

Question 9

Average Mark: 2.7 / 5

There was a general understanding of designing an ER diagram for the library system, but many candidates missed key details. While most candidates identified the entities and their relationships, they often struggled with specifying all necessary attributes and keys or making the diagram fully clear and complete. Common issues included incomplete diagrams or missing primary and foreign keys.

Question 10

Average Mark: 2.8 / 5

Candidates could outline the main features of hierarchical, network, and relational models, but their comparisons and scenarios were often too general. When discussing object-oriented databases, they generally covered the key characteristics but were less specific about when these databases would be a better choice than relational ones. Many candidates answered part b correctly. However, a substantial number did not go into detail when drawing the list, opting instead to draw some boxes and arrows. Most candidates answered part c correctly.

Question 11

Average Mark: 1.9 / 5

In general candidates did very badly in this question with the absolute majority getting it wrong. Some were trying to reason things out which showed some general understanding and effort. It may have been a case of the question being too difficult, or candidates not covering the topic appropriately.

Question 12

Average Mark: 2.5 / 5

There were no specific patterns to comment on in this question. Answers were evenly distributed in terms of correctness.

Question 13

Average Mark: 3.5 / 5

In general, this question on I/O was answered correctly. Practically everyone answered part b correctly whilst around have of the candidates answered part a incorrectly.

Question 14

Average Mark: 3.1 / 5

There were no specific patterns to comment on in this question. Answers were evenly distributed in terms of correctness.

Question 15

Average Mark: 3.1 / 5

Whilst in general, candidates did well in this question as a whole, performance indicated that candidates struggle with understanding the concept of interrupt handling and subsequently associating it with deadlocks and error handling (question 15a).

Question 16

Average Mark: 2.1 / 5

A handful of candidates answered this question on data structures correctly. Many candidates did not seem to understand the concept of a matrix and how it can be represented in a programming language with which they are familiar. This points to an unfortunate pattern whereby candidates seem to struggle with basic programming notions.

Question 17

Average Mark: 1.4 / 5

Whilst most candidates managed to answer part a correctly in terms of identifying an alternative search algorithm, many struggled to answer part b. This led to very poor overall performance.

Question 18

Average Mark: 1.7 / 5

Most candidates struggled to find practical examples on how imperative and functional paradigms can help solve the problem presented in the question.

Question 19

Average Mark: 4.1 / 5

Candidates did very well in this question overall.

Question 20

Average Mark: 2.8 / 5

Most candidates identified the right instance variables and data types, though there were some problems in choosing the best types. The constructor was mostly correct, but a few candidates didn't set default values properly. The method to mark a task as completed was usually included but sometimes wasn't clear or well implemented.

Paper II

Question 1

Average Mark: 15.4 / 20

This question was attempted by 119 candidates.
The candidates showed a strong understanding of designing combinational logic circuits using Karnaugh maps. Most candidates correctly developed Karnaugh maps for each output variable and labelled the rows and columns properly. However, some candidates missed key steps in grouping and simplification. When designing the combinational logic circuit, candidates generally performed well, but some diagrams lacked clarity or completeness. A common challenge was deriving simplified Boolean expressions for the outputs, particularly when handling 'don't care' conditions.

Question 2

Average Mark: 15.8 / 20

This question was attempted by 111 candidates.
Candidates showed a good understanding of computer networks and their importance, giving clear definitions and examples. They correctly explained the differences between point-to-point and multipoint communications, as well as serial and parallel communications, though some details were missing. Most understood simplex, half duplex, and full duplex communications well and gave good examples. They used diagrams to show the differences between analogue and digital communication and described the role of modems clearly.

Question 3

Average Mark: 13.3 / 20

This question was attempted by 45 candidates.
A solid grasp of the different modelling techniques was evident, but there were challenges with some specifics. Most successfully created Level 1 data flow diagrams, use-case diagrams, and class diagrams, though some diagrams lacked clarity or detail. Explanations on how UML diagrams aid in system modelling were generally good but needed further elaboration. The advantages of a modular design approach were well described, but the discussion on prototyping and its significance, including its application to the Candidate Enrolment System, often lacked sufficient detail.

Question 4

Average Mark: 13.5 / 20

This question was attempted by 78 candidates.
Candidates performed at an "average" level on this question, seemingly fitting to a normal distribution. Only a few of candidates managed to earn at least one mark part e, with those who earned marks providing very high-level answers without delving into the appropriate depth. This indicates a lack of understanding of the content of the question overall. Many candidates did not go into enough detail in part a, which was worth 7 marks.

Question 5

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 6

Average Mark: 13.9 / 20

This question was attempted by 121 candidates.
In general, candidates performed well in this question but struggled with the concept of a real-world scenario. What we were after was not driving a car and stopping at traffic lights but something more like a web server hosting multiple sites or a word processing application.

Question 7

Average Mark: 17.4 / 20

This question was attempted by 73 candidates.
Candidates did extremely well in this question.

Question 8

Average Mark: 11.6 / 20

This question was attempted by 59 candidates.

Candidates achieved "average" performance in this question. Most seemed to confuse virtual machines with hardware simulators rather than applying to the context of the question and relating VMs to something like the JVM. Many candidates also struggled with JIT compilation, macro pre-processors and p-code compilers.

D. CONCLUDING COMMENTS

Whilst grades obtained by candidates are broadly comparable with previous sessions, as in previous years, a pattern whereby candidates struggle with scenario-based and, more worryingly, programming tasks which are not clearly laid out in a granular fashion, was noted. The overall candidates' performance indicates lack of problem skills. More focus should be placed on mental models of breaking down non-trivial problems, selecting the right tools for their solution, and applying these tools to solve the problem at hand.

Chairperson
Examiners Panel 2024