



OCR H446
(Both 2hrs 30 mins)
PAPER 1 (40%): Computer Systems
PAPER 2: (40%) Algorithms and Programming

YEAR 13
A-LEVEL

1.4.2 Data structures
 Arrays. Linked Lists, binary search trees. Stacks and Queues.



1.4.2 Boolean algebra
 Boolean Logic. Boolean Expressions and Karnaugh Maps. De Morgan's Laws, distribution, association, commutation, double negation. Logic Gates



1.3.4 Web technologies
 HTML, CSS & Javascript. Search Engine Indexing, PageRank. Server & client side processing



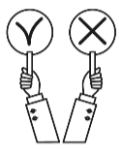
1.3.1 Compression, encryption and hashing
 Lossy vs Lossless compression. Run Length and Dictionary encoding. Symmetric and asymmetric encryption. Hashing.



1.2.4 Types of programming language
 Procedural languages, Assembly Language. Modes of addressing memory. Object-oriented languages



1.2.2 Applications generation
 Utility Software. Open vs closed source. Translators: compilers, interpreters & assemblers. Stages of compilation. Linkers, loaders and use of libraries



3.4 Evaluation



3.3 Developing the solution

2.3.1 Algorithms
 Analysis and design of algorithms. Big O notation (constant, linear, polynomial, exponential and logarithmic complexity). Algorithms for the main data structures. bubble sort, insertion sort, merge sort, quick sort, Dijkstra's shortest path algorithm, A* algorithm, binary search and linear search.



3.2 Design of the solution



3.1. Analysis of the problem

2.2.2 Computational methods
 Features that make a problem solvable by computational methods. Problem recognition. Problem decomposition. Use of divide and conquer. Use of abstraction.



1.3.2 Databases
 Creating and normalising relational databases. Methods of capturing and encoding data. Using SQL to interpret and modify datasets. Transactional processing – ACID rules



1.2.3 Software development
 Waterfall lifecycle, agile methodologies, extreme programming, the spiral model and rapid application development. Writing and following algorithms



1.2.1 Systems software
 Distributed, embedded, multi-tasking, multi-user and Real Time operating systems. Memory Management. Scheduling algorithms and interrupt routines. BIOS. Device Drivers. Virtual Machines.



1.1.2 Types of processor
 CISC vs RISC. GPU's and their uses. Multicore and parallel systems.



1.1.1 Structure and function of the processor
 CPU components and registers. The FDE cycle. Factors affecting CPU performance including pipelining. CPU architecture.



1.1.3 Input, output and storage
 How different input, output and storage devices can be applied to the solution of different problems. The uses of magnetic, flash and optical storage devices. RAM and ROM. The need for virtual storage.



2.2.1 Programming techniques
 Sequence, selection, Iteration. Recursion. Global and Local variables. Modularity, functions and procedures. OO Techniques.



2.1.5 Thinking concurrently
 Determine the parts of a problem that can be tackled at the same time. Outline the benefits and trade offs of concurrent processing.



2.1.4 Thinking logically
 Identifying where decisions need to be made. Determine where logical conditions affect decision outcomes. Determine how decisions affect the flow of a program.



2.1.3 Thinking procedurally
 Identifying the components of a problem and the solution. Determine the order of the steps needed to solve a problem. Identify sub-procedures.



2.1.1 Thinking abstractly
 The nature and need for abstraction. The difference between abstraction and reality. Devising abstract models



2.1.2 Thinking ahead
 Identifying inputs and outputs. The use of caching. The need for reusable program parts.



YEAR 12
A-LEVEL



1.4.1 Data Types
 Understanding different data types. Adding and subtracting positive and negative binary numbers. Normalising floating point values. Understanding character sets and their uses.



1.5.1 Computing related legislation
 Legislation surrounding the use of computers and issues that can or may in the future arise from the use of computers



1.5.2 Moral, ethical and cultural issues
 The individual moral, social, ethical and cultural opportunities and risks of digital technology. AI, computers in the workforce, environmental issues.

