Computer Science Revision List

Paper 1

1.1.1 Architecture of the CPU	the purpose of the CPU
	o the fetch-execute cycle
	common CPU components and their function:
	o ALU (Arithmetic Logic Unit)
	o CU (Control Unit)
	o Cache
	o Registers
	Von Neumann architecture:
	o MAR (Memory Address Register)
	o MDR (Memory Data Register)
	o Program Counter
	o Accumulator
1.1.2 CPU Performance	How common characteristics of CPUs affect their performance
	o clock speed
	o cache
	o number of cores
1.1.3 Embeded Systems	o The purpose and characteristics of embedded systems
	o Examples of embedded systems
1.2.1 Primary storage (Memory)	The need for primary storage
	The difference between RAM and ROM
	The purpose of ROM in a computer system
	The purpose of RAM in a computer system
	Virtual Memory
1.2.2 Secondary storage	The need for secondary storage
	Common types of storage:
	o Optical
	o Magnetic
	o Solid state
	Suitable storage devices and storage media for a given application
	The advantages and disadvantages of different storage devices and storage media relating to these characteristics:

	o Capacity
	o Speed
	o Portability
	o Durability
	o Reliability
	o Cost
1.2.3 Units	The units of data storage:
	o Bit
	o Nibble (4 bits)
	o Byte (8 bits)
	o Kilobyte (1000 bytes or 1 KB)
	o Megabyte (1,000 KB)
	o Gigabyte (1,000 MB)
	o Terabyte (1,000 GB)
	o Petabyte (1,000 TB)
	How data needs to be converted into a binary format to be processed by a computer
	Data capacity and calculation of data capacity requirements
1.2.4 Data storage	**Numbers**
	How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa
	How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur
	How to convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa
	How to convert from binary to hexadecimal equivalents and vice versa
	Binary shifts
	Characters
	The use of binary codes to represent characters
	The term ‘character-set’
	The relationship between the number of bits per character in a character set, and the number of characters which can be represented, e.g.:
	o ASCII
	o Unicode
	Images

	How an image is represented as a series of pixels, represented in binary
	Metadata
	The effect of colour depth and resolution on:
	o The quality of the image
	o The size of an image file
	Sound
	How sound can be sampled and stored in digital form
	The effect of sample rate, duration and bit depth on:
	o The playback quality
	o The size of a sound file
1.2.5 Compression	The need for compression
	Types of compression:
	o Lossy
	o Lossless
1.3.1 Networks & Topologies	Types of Network
	Lan (Local Area Network)
	Wan (Wide Area Network)
	Factors that affect the performance of networks
	The hardware needed to connect stand-alone computers into a Local Area Network:
	o Wireless access points
	o Routers
	o Switches
	o NIC (Network Interface Controller/Card)
	o Transmission media
	The Internet as a worldwide collection of computer networks:
	o DNS (Domain Name Server)
	o Hosting
	o The Cloud
	o Webservers and Clients
	Star and Mesh nework topologies
1.3.2 Wired and wireless networks, protocols and layers	Modes of connection:
	o Wired
	• Ethernet
	o Wireless

	• Wi-Fi
	• Bluetooth
	Encryption
	IP addressing and MAC addressing
	Standards
	Common protocols including:
	o TCP/IP (Transmission Control Protocol/Internet Protocol)
	o HTTP (Hyper Text Transfer Protocol)
	o HTTPS (Hyper Text Transfer Protocol Secure)
	o FTP (File Transfer Protocol)
	o POP (Post Office Protocol)
	o IMAP (Internet Message Access Protocol)
	o SMTP (Simple Mail Transfer Protocol)
	The concept of layers
1.4.1 Threats to computer systems and networks	Forms of attack
	o Malware
	o Social engineering, e.g. phishing, people as the 'weak point'
	o Brute-force attacks
	o Denial of service attacks
	o Data interception and theft
	o The concept of SQL injectio
1.4.2 Identifying and preventing vulnerabilities	Common prevention methods:
	o Penetration Testing
	o Anti-malware software
	o Firewalls
	o User access levels
	o Passwords
	o Encryption
	o Physical Security
1.5.1 Operating Systems	˙The purpose and functionality of operating systems:
	o User interface
	o Memory management and multitasking
	o Peripheral management and drivers
	o User management
	o File management
1.5.2 Utility	˙The purpose and functionality of utility software

Software	ˋUtility system software:
	o Encryption software
	o Defragmentation
	o Data compression
1.6.1 Ethical, legal, cultural and environmental impact	Impacts of digital technology on wider society including:
	o Ethical issues
	o Legal issues
	o Cultural issues
	o Environmental issues
	o Privacy issues
	Legislation relevant to Computer Science:
	o The Data Protection Act 2018
	o Computer Misuse Act 1990
	o Copyright Designs and Patents Act 1988
	o Software licences (i.e. open source and proprietary)
	o Open source and proprietary software

Paper 2

2.1.1 Computational thinking	Principles of computational thinking
	o Abstraction
	o Decomposition
	o Algorithmic Thinking.
2.1.2 Designing, creating and refining algorithms	Identify the inputs, processes, and outputs for a problem
	Structure diagrams
	Create, interpret, correct, complete, and refine algorithms using:
	o Pseudocode
	o Flowcharts
	o Reference language/high-level programming language
	Identify common errors
	Logic
	Syntax
	Trace tables
2.1.3 Searching and sorting	Standard searching algorithms:
	o Binary search

algorithms	o Linear search
	Standard sorting algorithms:
	o Bubble sort
	o Merge sort
	o Insertion sort
2.2.1 Programming fundamentals	The use of variables, constants, operators, inputs, outputs and assignments
	The use of the three basic programming constructs used to control the flow of a program:
	o Sequence
	o Selection
	o Iteration (count- and condition- controlled loops)
	The common arithmetic operators
	The common Boolean operators AND, OR, NOT
2.2.2 Data types	The use of data types:
	o Integer
	o Real
	o Boolean
	o Character and string
	o Casting
2.2.3 Additional programming techniques	The use of basic string manipulation
	The use of basic file handling operations:
	o Open
	o Read
	o Write
	o Close
	The use of records to store data
	The use of SQL to search for data
	The use of arrays (or equivalent) when solving problems, and
	including both one-dimensional (1D)
	two-dimensional (2D) arrays
	How to use sub programs (functions and procedures) to produce structured code
	Procedures
	Functions
	Random number generation
2.3.1 Defensive design	Defensive design considerations:
	o Anticipating misuse
	o Authentication

	Input validation
	Maintainability:
	o Use of sub programs
	o Naming conventions
	o Indentation
	o Commenting
2.3.2 Testing	The purpose of testing
	Types of testing:
	o Iterative
	o Final/terminal
	Identify syntax and logic errors
	Selecting and using suitable test data:
	o Normal
	o Boundary - test data as data of the correct type which is on the very edge of being valid
	Refining algorithms
2.4.1 Boolean logic	Simple logic diagrams using the operations AND, OR and NOT
	Truth tables
	Combining Boolean operators using AND, OR and NOT
	Applying logical operators in truth tables to solve problems
2.5.1 Languages	Characteristics and purpose of different levels of programming language:
	o High-level languages
	o Low-level languages
	The purpose of translators
	The characteristics of a compiler and an interpreter
2.5.2 The Integrated Development Environment (IDE)	Common tools and facilities available in an integrated development environment (IDE):
	o Editors
	o Error diagnostics
	o Run-time environment
	o Translators