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**COMPUTER SCIENCE**

**9608/13**

Paper 1 Written Paper

**October/November 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

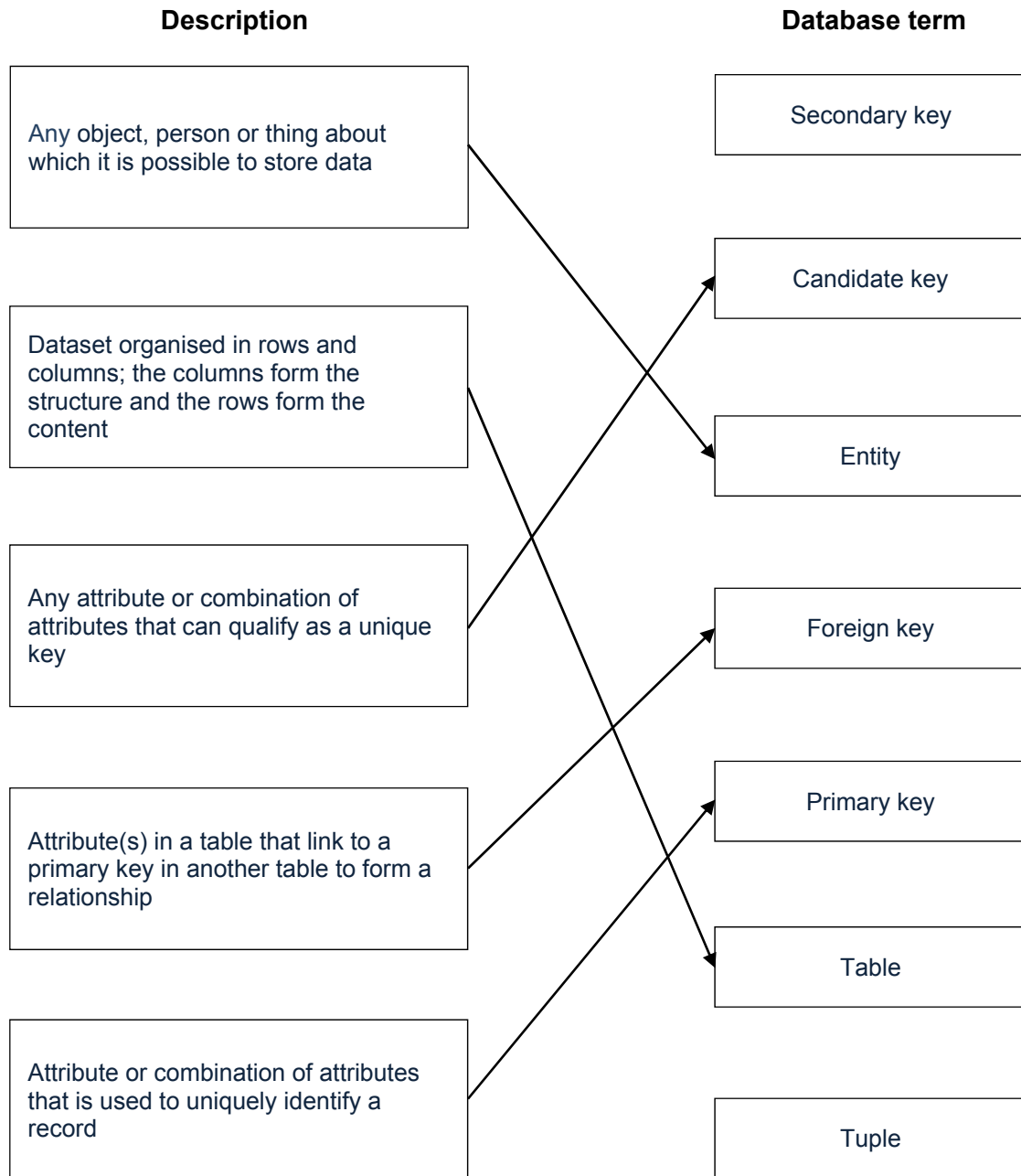
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- 1 (a) One mark for each correct line.  
Two lines from any box on left means no mark for that description.



[5]

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(b) Any **three** from:

- Ensures related data in tables are consistent
- If one table has a foreign key (the 'foreign' table)...
- ... then it is not possible to add a record to that table / the 'foreign' table
- ... unless there is a corresponding record in the linked table with a corresponding primary key (the 'primary' table)
- Cascading delete
- If a record is deleted in the 'primary' table...
- all corresponding linked records in 'foreign' tables must also be deleted
- Cascading update
- If a record in the 'primary' table is modified...
- ... all linked records in foreign tables will also be modified

[3]

2 (a) Any **two** from:

- DRAM has to be refreshed / charged  
// SRAM does not request a refresh
- DRAM uses a single transistor and capacitor  
// SRAM uses more than one transistor to form a memory cell  
// SRAM has more complex circuitry
- DRAM stores each bit as a charge  
// SRAM each bit is stored using a flip-flop / latch
- DRAM uses higher power( because it requires more circuitry for refreshing)  
// SRAM uses less power (no need to refresh)
- DRAM less expensive (to purchase / requires fewer transistors )  
// SRAM is more expensive (to buy as it requires more transistors)
- DRAM has slower access time / speed (because it needs to be refreshed)  
// SRAM has faster access times
- DRAM can have higher storage / bit / data density  
// SRAM has lower storage / bit / data density
- DRAM used in main memory  
// SRAM used in cache memory

[2]

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(b) (i) Any **two** from

- The hardware is unusable without an OS // hides complexity of hardware from user
- Acts as an interface / controls communications between user and hardware / hardware and software
- Provides software platform / environment on which other programs can be run [2]

(ii) Any **two** from:

- Process / task / resource management
- Main memory management
- Peripheral / hardware / device management
- File / secondary storage management
- Security management
- Provision of a software platform / environment on which other programs can be run – only if not given in part (b)(i)
- Interrupt handling
- Provision of a user interface run – only if not given in part (b)(i) [2]

(c) Any **two** from:

- A DLL file is a shared library file
- Code is saved separately from the main .EXE files
- Code is only loaded into main memory when required at run-time
- The DDL file can be made available to several applications (at the same time) [2]

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- 3 (a) (i) 0 0 1 0 1 1 1 0 [1]
- (ii) 1 1 0 1 0 0 1 0 [1]
- (iii) 2 E [1]

(b) (i) **One mark** for the explanation and **one mark** for the example

- Each denary digit is written as a 4-bit binary number
- Example: 46 = 0100 0110 [2]

(ii) **One mark** for the explanation and **one mark** for the example

- Binary number is split up into groups of 4 bits (starting from the right)  
// Each group of 4 bits is converted to a denary digit
- Example: 0011 0111 = 37 [2]

4 (i) **Keyboard**

Any **two** from:

- Uses switches and circuits to translate keystrokes into signals the computer can understand
- The key matrix is a grid of circuits / three layers of plastic underneath the keys
- Each circuit is broken beneath the key / middle layer contains holes
- When key pressed, a circuit is made / completed and a signal is sent
- Processor compares location of signal from key matrix to a character map stored on ROM
- A character code for each key press is saved in a keyboard buffer [2]

(ii) **Optical Disc**

Any **two** from:

- Drive motor is used to spin the disc
- Tracking mechanism moves the laser assembly
- A lens focuses the laser onto the disc
- Laser beam is shone onto disc to read / write
- Surface of disc has a reflective metal layer / phase change metal alloy
- Track(s) on the disc have sequence of pits and lands / amorphous and crystalline state
- Reflected light is then encoded as a bit pattern [2]

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(iii) **Optical mouse**

Any **two** from:

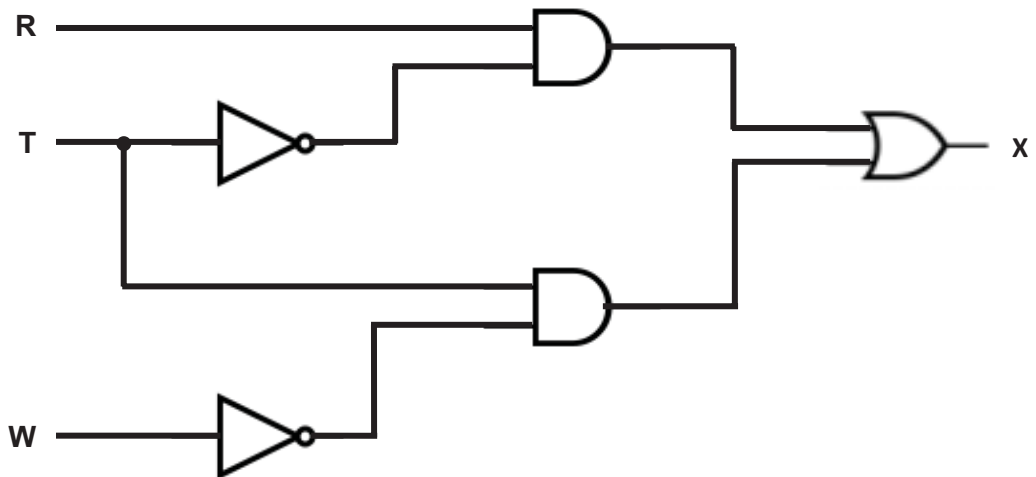
- Laser / light shines onto a surface
- Through a (polished) ring at the base
- The light is reflected from the surface through the ring
- Sensor detects reflected light
- Capturing details / photograph of surface (under the ring)
- At about 1500 times per second
- As the mouse moves the sensor detects changes in the surface detail / photograph
- Which are translated into movement (change of x and y co-ordinates)
- The processor/software updates the position of the cursor on the screen [2]

(iv) **Scanner**

Any **two** from:

- Main component of a scanner is a CCD array
- CCD is a collection of light sensitive diodes
- Laser beam / light is shone onto the source document/barcode
- The scanned image reaches the CCD through mirrors and lenses
- Sensors detect levels of reflected light
- Brighter light results in greater electrical charge
- Light intensity is converted (by software) to a digital value [2]

5 (a) (i) One mark for each correct gate.



[5]

(ii)  $(R.\bar{T})+(T.\bar{W})$  // (R AND NOT T) OR (T AND NOT W)

[2]

(iii) One mark for each pair of lines as shaded.

INPUT			Working space	OUTPUT X
R	T	W		
0	0	0		0
0	0	1		0
0	1	0		1
0	1	1		0
1	0	0		1
1	0	1		1
1	1	0		1
1	1	1		0

[4]

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6 Any **four** from:

- User needs high-speed broadband (connection)
- Data is streamed to a buffer (in the computer)
- Buffering stops video pausing as bits streamed
- As buffer is emptied, it fills up again so that viewing is continuous
- Actual playback is (a few seconds) behind the time the data is received by computer [4]

7 (a) **One mark** for the name and **one mark** for the explanation for **three** utility programs

- Disk formatter
- Prepares a hard disk to allow data to be stored on it
  
- Virus checker
- Checks for viruses and then quarantines removes any virus found
  
- File compression
- Reduces file size by removing redundant details (lossy / lossless)
  
- Backup software
- Makes copy of files on another medium in case of corruption / loss of data
  
- Firewall
- Prevents unauthorised access to computer system from external sources [6]

(b) **Four** from:

- Bitmap is made up of pixels  
// Vector graphic store a set of instructions about how to draw the shape
- Bitmap files are usually bigger than vector graphics files // Take up more memory space
- Enlarging a bitmap can mean the image is pixelated  
// vector graphic can be enlarged without the image becoming pixelated
- Bitmap images can be compressed (with significant reduction in file size)  
// Vector graphic images do not compress well
- Bitmaps are suitable for photographs / scanned images  
// Vector graphics are suitable for more geometric shapes
- Bitmap graphics use less processing power than vector graphics
- Individual elements of a bitmap cannot be grouped  
// Individual elements of a vector graphic can be grouped
- Vector graphics need to be 'rasterised' in order to display or print [4]



- (c) (i) • Hackers can still access the data (and corrupt it, change it or delete it)  
 • Encryption simply makes data incomprehensible (without decryption key / algorithm) [2]

(ii) Any **two** from:

- This is an explanation of data verification (not validation)
- Data validation ensures that data is reasonable / sensible / within a given criteria
- Original data may have been entered correctly but is not reasonable (e.g. age of 210) [2]

- (iii) • A password does not prevent unauthorised access, it makes it more difficult  
 • Password can be guessed (if weak) // Password can be stolen // A relevant example of misappropriation of password [2]

8 (a) (i)

Accumulator: 

1	0	0	1	0	1	1	1
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[1]

(ii) **One mark** for answer and **two marks** for explanation

Accumulator: 

1	1	0	0	0	0	1	0
---	---	---	---	---	---	---	---

- Index Register contains  $1001 = 9$
- $800 + 9 = 809$  [3]

(b) (i) **ONE** mark for each correct row.

ACC	Memory address				OUTPUT
	800	801	802	803	
	40	50	0	90	
40					
90			90		
90			90		
					Z

[4]

(ii) **107**

[1]

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(c) (i) Any **two** from:

- Only 128 / 256 characters can be represented
  - Uses values 0 to 127 (or 255 if extended form) / one byte
  - Many characters used in other languages cannot be represented
  - In extended ASCII the characters from 128 to 255 may be coded differently in different systems
- [2]

(ii) Any **two** from:

- Uses 16, 24 or 32 bits / two, three or four bytes
  - Unicode is designed to be a superset of ASCII
  - Designed so that most characters (in other languages) can be represented
- [2]