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COMPUTER SCIENCE **9608/13**

Paper 1 Written Paper **October/November 2016**

MARK SCHEME

Maximum Mark: 75

Published

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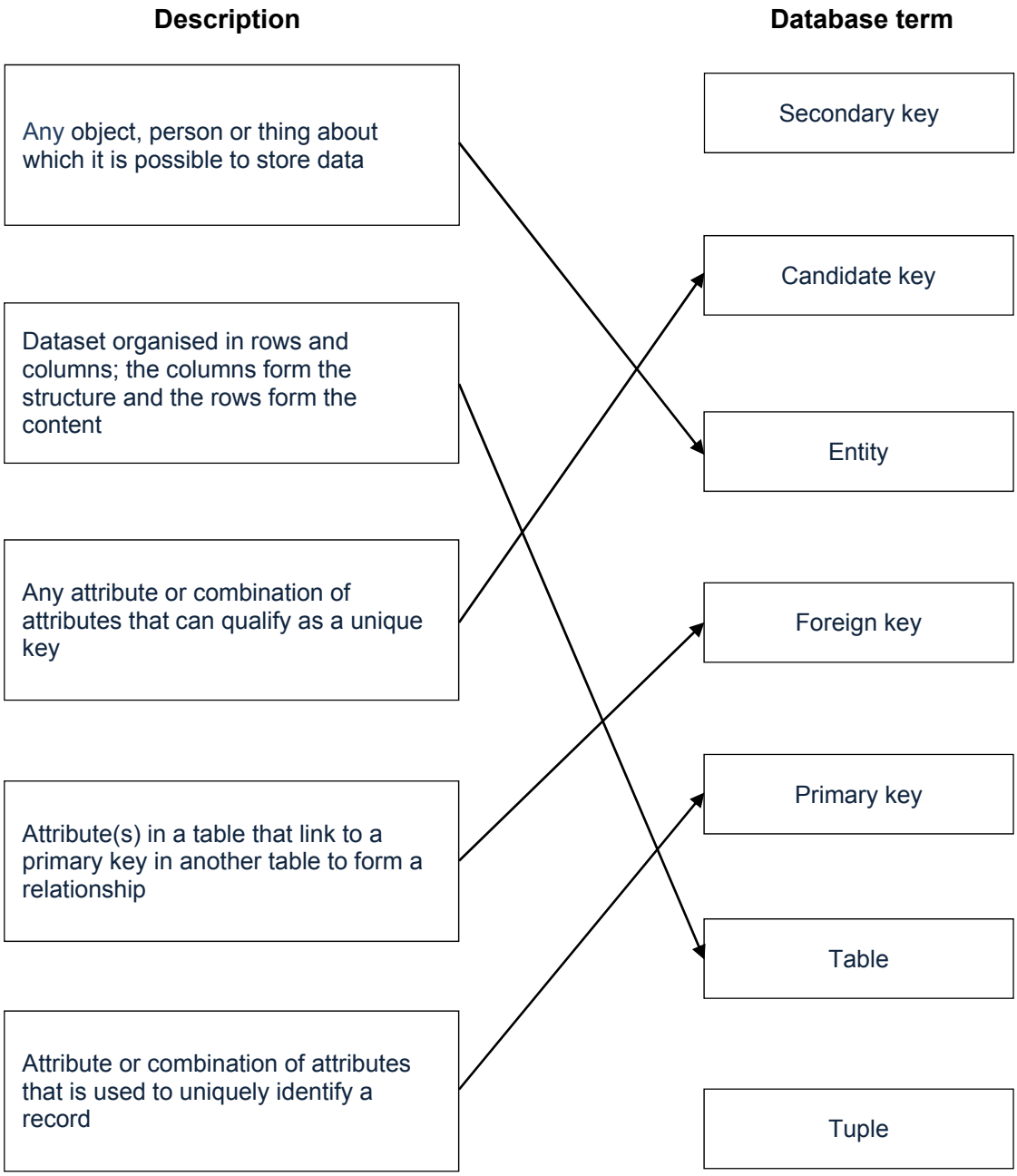
1 (a) **One mark** for each correct line.
Two lines from any box on left means no mark for that description.



[5]

(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 <u>storage / bit / data</u> density
  // SRAM has lower <u>storage / bit / data</u> density

- DRAM used in main memory
  // SRAM used in cache memory [2]

(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]

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 mar**k 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 mar**k 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 in then encoded as a bit pattern [2]

(iii) Optical mouse

Any **two** from:

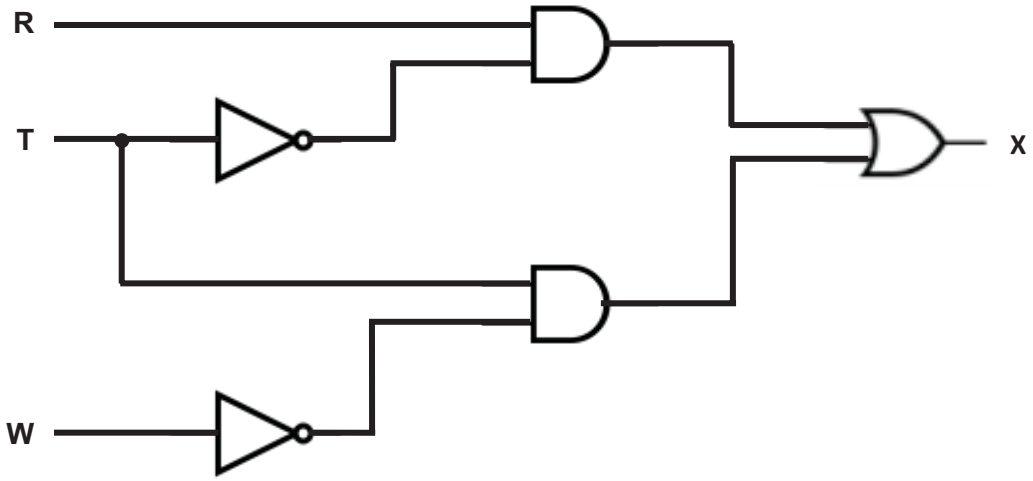
- Laser / light shines onto a surface
- Through a (polished) ring at the base
- The light is reflected from the surface through the ring
- Sensor detects reflected light
- Capturing details / photograph of surface (under the ring)
- At about 1500 times per second
- As the mouse moves the sensor detects 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) $\underline{\left(R.\bar{T}\right)}+\underline{\left(T.\bar{W}\right)}$ // <u>(R AND NOT T)</u> <u>OR (T AND NOT W)</u> [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]

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**

[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]

(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]