Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/12**

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

MARK SCHEME

Maximum Mark: 75

Published

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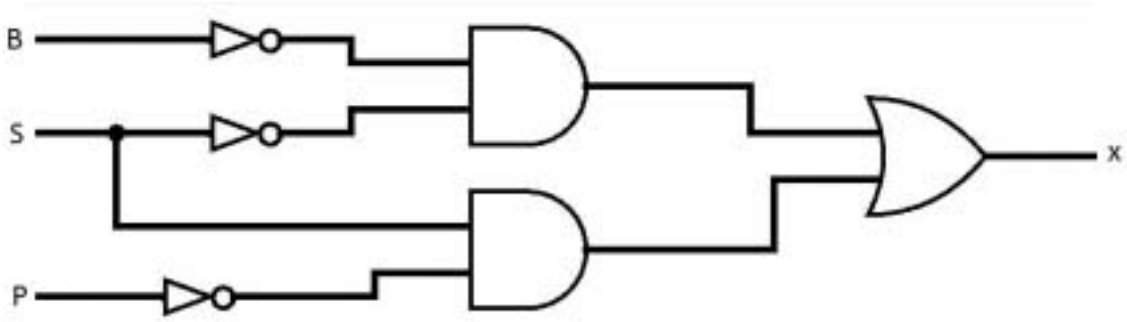
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1 (a) **ONE** mark for each correct gate.



[6]

(b) **ONE** mark for each pair of rows.

B	S	P	Working space	X
0	**0**	**0**		1
0	**0**	**1**		1
0	**1**	**0**		1
0	**1**	**1**		0
1	**0**	**0**		0
1	**0**	**1**		0
1	**1**	**0**		1
1	**1**	**1**		0

[4]

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2 (a) The number of images / frames recorded per second / unit time.
// The frequency with which the images/frames are recorded.

[1]

(b) **ONE** mark per bullet point below. **MAX THREE** marks per type of encoding.

Interlaced encoding

- The data from a single frame are encoded as two separate **fields**.
- One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines.
- The image is rendered by alternating between the even field and the odd field (of each successive frame).
- The viewer sees data from two frames simultaneously
- The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate).
- Originally used in television broadcasting and adapted for video recordings.
- Produces what appears to the eye to be a high refresh rate.
- Halves the transmission bandwidth requirements.

Progressive encoding

- Stores the data for an entire frame and displays all the frame data at the same time.
- The rate of picture display is the same as the frame rate.
- Used by traditional film / video digitised from a film camera / computer displays progressive encoding.
- High bandwidth requirements.

[4]

(c) (i) **ONE** mark per term.

Description	Term
Pixels in two video frames have the same value in the same location. There is duplication of data between frames.	**Temporal redundancy**
A sequence of pixels in a single video frame have the same value.	**Spatial redundancy**

[2]

(ii) (File) compression

[1]

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3 **ONE** mark for each letter in the correct place.

Then **ONE** mark for any pair of letters in the correct order, but not in the correct place

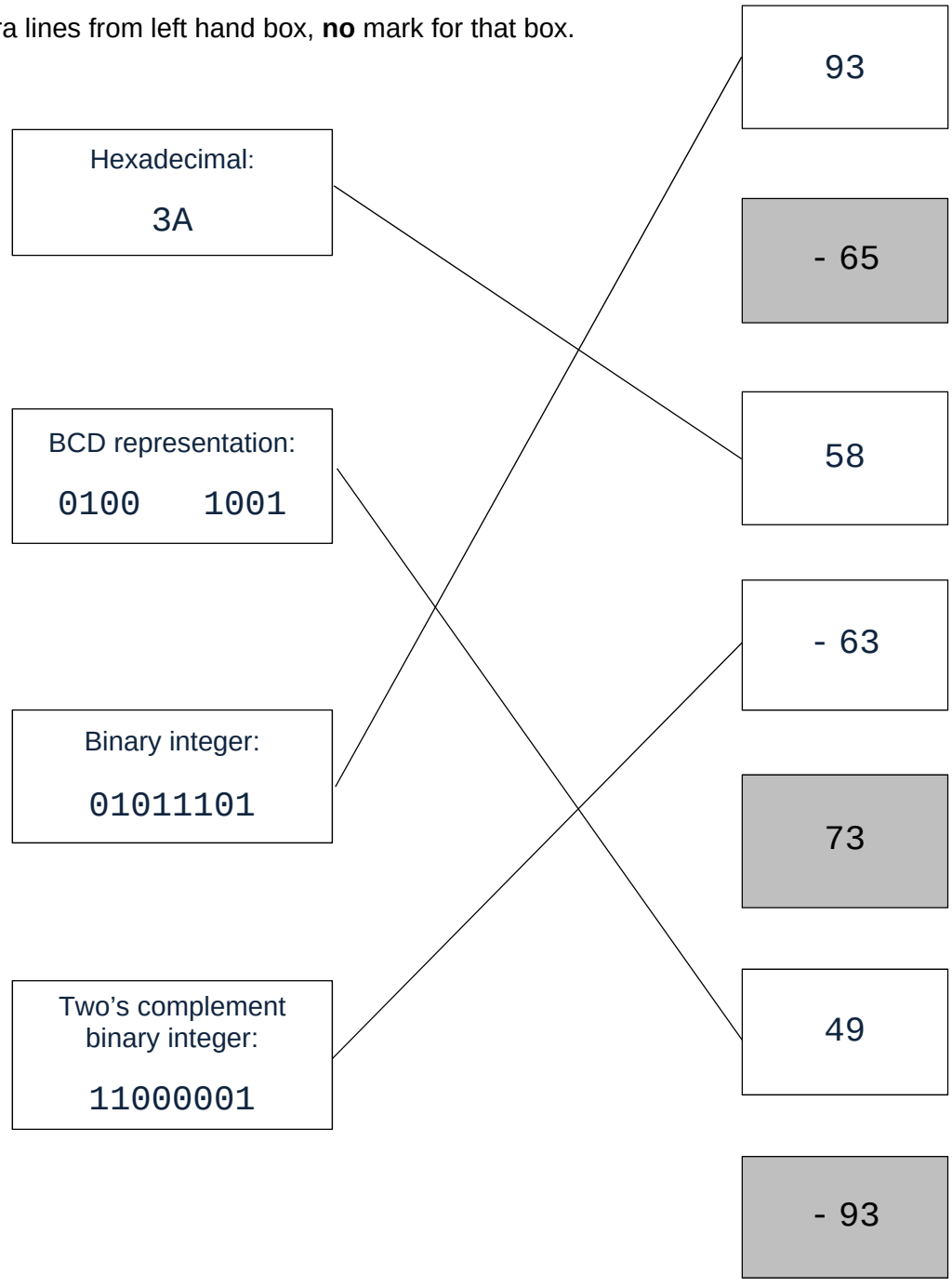
1	The application program executes a statement to read a file.
2	G
3	The operating system begins to spin the hard disk, if it is not currently spinning.
4	F
5	D
6	H
7	C
8	B
9	A
10	E

[8]

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4 **ONE** mark for each correct line.

Extra lines from left hand box, **no** mark for that box.



[4]

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5 (a) (i)

0	1	1	1	0	0	1	1

[1]

(ii) **ONE** mark for Accumulator contents, **ONE** mark for the explanation.

1	0	1	1	0	0	0	1

- Index Register holds the value 4; 101 + 4 = 105 so load data from address 105

[2]

(iii) **ONE** mark for Accumulator contents, **TWO** marks for the explanation.

0	1	0	0	1	0	1	1

- Memory address 103 contains the value 107
- So address 107 is the address from which to load the data [3]

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

ACC	Memory address			
	810	**811**	**812**	**813**
	28	41	0	0
28				
29				
			29	
41				
70				
				70

[6]

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6 (a) **ONE** mark for each difference from the bullet points below.

- RAM loses content when power turned off / volatile memory / temporary memory
  ROM does not lose content when power turned off / non-volatile memory / permanent memory

- Data in RAM can be altered / deleted / read from and written to
  ROM is read only / cannot be changed / altered / deleted

- RAM stores files / data / operating system currently in use
  ROM is used to store BIOS / bootstrap / pre-set instructions [2]

(b) **THREE** 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

[3]

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7 **ONE** mark per bullet point, **MAX TWO** marks per task.

- Process / resource management
- Scheduling of processes / multi-tasking / multi-programming etc.
- Resolution of conflicts when two or more processes require the same resource

- Main memory management
- Memory protection to ensure that two programs do not try to use the same space
- Use of virtual memory
- Deciding which processes need to be in main memory at any one time
- Location of processes within the memory
- By example, e.g. when process terminates, memory is made available

- Peripheral / hardware / device management
- Installation of appropriate driver software
- Controls access to data being sent to / from hardware / peripherals
- Controls access to hardware / peripherals
- Manages communication between devices / hardware and software

- File / secondary storage management
- Maintains directory structures
- Provides file naming conventions
- Controls access

- Security management
- Makes provision for recovery when data is lost
- Provides usernames and passwords / encryption / user accounts
- Prevents unauthorised access
- Ensures privacy of data

- Provision of a software platform / environment
- On which other programs can be run

- Interrupt handling
- Identifies priorities of interrupts
- Save current memory / process values / saves data on power outage
- Loads appropriate Interrupt Service Routine (ISR)
- Any relevant example

[4]

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8 (a) **ONE** mark for each bullet point from **MAX TWO** groups.

- The code is already written
- (So the programmer is not starting over again) which saves time

- The code will have been used by many people
- So it should be already thoroughly tested // relatively error-free

- The programmer can use, e.g. mathematical / graphics functions, etc. (may not know how to code)
- Can be sure that the function will perform as it should // simplifies the program.

- The code should conform to industry standards
- And therefore contribute towards a more robust program

[4]

(b) (i) **ONE** mark for each benefit, and **ONE** mark for a further expansion.

- The executable file is smaller / the executable does not contain all the library routines …
- … DLL files are only loaded into memory when required.

- Changes / improvements / error correction to the DLL file code are done independently of the main program...
- … So there is no need to recompile the main program
- … All programs using it will benefit

- A single DLL file can be made available to several application programs...
- … Saving space in memory / easing the pressure on memory

[4]

(ii) **ONE** mark for each bullet point from **MAX ONE** group.

- The executable code is not self-contained …
- … the DLL file(s) needed to be included at run time.

- Appropriate (linking) software must be available at run-time …
- … to link / include / import the DLL files.

- The DLL file must be present …
- … otherwise (unable to find X.dll) errors

- Unexpected changes to the DLL file / corrupted DLL file …
- … could mean the program stops working as expected

- Malicious changes to the DLL file …
- … could install a virus on the user's computer / related files could be corrupted

[2]

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9 (a) **ONE** mark for each reason and **ONE** mark for a further explanation. **MAX THREE** reasons.

- Reduced data redundancy / data duplication
- Data is stored in (separate) linked tables

- The database (generally) stores data only once / data need only be updated once
- Improved data consistency / integrity / associated data will be automatically updated / easier to maintain the data / elimination of unproductive maintenance

- Complex queries can be more easily written
- To search / find specific data // specific example related to the Health Club

- Fields can be more easily added to or removed from tables
- Without affecting existing applications (that do not use these fields)

- Program-data dependence is overcome
- Changes to the data (design) do not require changes to programs // changes to programs do not require changes to data // the data can be accessed by any appropriate program

- Security is improved
- Each application only has access to the fields it needs // different users can be given different access rights

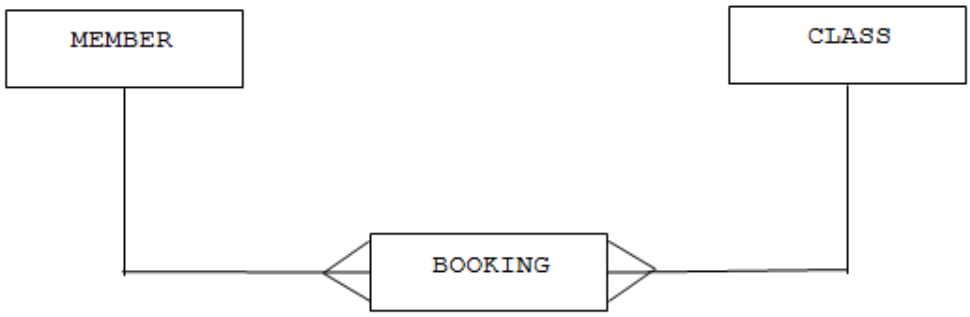
- Different users can be given different views of the data / data privacy is maintained
- So they do not see confidential information

- Allows concurrent access
- Record locking prevents two users updating the same record at the same time // record locking assures data consistency

[6]

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(b) **ONE** mark for each correct relationship as shown.



[2]

(c) An example of a script is shown, but different syntax may be used.

```
CREATE TABLE CLASS (
     ClassID VARCHAR(5),
     Description VARCHAR(30),
     StartDate DATE,
     ClassTime TIME,
     NoOfSessions INT,
     AdultsOnly BIT,
     PRIMARY KEY(ClassID)
);
```

Mark as follows:

1 mark for `CREATE TABLE CLASS` and `();`
1 mark for `PRIMARY KEY(ClassID)`
1 mark for both `ClassID VARCHAR(5),` and `Description VARCHAR(30),`
1 mark for both `StartDate DATE,` and `ClassTime TIME,`
1 mark for `NoOfSessions INT,`
1 mark for `AdultsOnly BIT,`

[6]

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