UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

0420 COMPUTER STUDIES

0420/11 Paper 11, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1 (a) video conferencing

Any **two** points from:
- meeting between 2 or more participants
- using computer networks/Internet
- to transmit audio/video data in real time
- pictures appear in a window on a monitor in real time
- *reference to hardware (webcams, speakers, microphones)*
- *reference to software (communications, compression)* [2]

(b) simulation

Any **two** points from:
- studying the behaviour of a system
- by using a model/mathematical representation
- results can be predicted
- e.g. flight (or other) simulator, modelling hazardous chemical processes
- e.g. 10-pin bowling computer game [2]

(c) interrupt

Any **two** points from:
- a signal/request generated by a device/program
- which causes a break in the execution of a program/stops the program
- e.g. printer out of paper, <BREAK> key pressed, disk full [2]

(d) batch processing

Any **two** points from:
- processing doesn't start until **all** data is collected
- JCL (any *reference to Job Control Language)*
- no need for user interaction
- processed all in one go
- done at "quiet" times
- output not time sensitive
- e.g. billing, payroll, cheque processing [2]

(e) expert system

Any **two** points from:
- computer system that emulates/simulates human knowledge/contains knowledge of human expert
- uses an inference engine
- contains a knowledge base
- made up of rule base
- reference to expert system shell
- outputs probability of diagnosis given being correct/produces reasoned conclusions
- uses "Yes/No", multichoice interface
- e.g. medical diagnosis, chess, prospecting, financial modelling, diagnostics [2]

2 Any **two** tasks from:
- design data collection forms
- design input forms/user interface
- design systems flowcharts
- design output forms/reports/screens
- design/select validation rules
- design/select verification methods
- design test plan/strategy
- specify/select hardware
- specify/select software
- design algorithms/program flowcharts/pseudocode
- specify data structures
- design files (structures)/tables / layout
- design queries [2]

3 **(a)** Any **two** features from:
- sound and/or video clips embedded in the presentation/multimedia
- animation effects
- diagrams/graphs/charts (in colour)/colour/text fonts etc
- hyperlinks [2]

(b) Any **two** from:
- how it affects tasks such as filing/ordering etc.
- retraining aspects
- deskilling aspects
- unemployment [2]

4 Any **three different** reasons and associated preventions (prevention must match reason):
1 mark for reason, **1** mark for prevention
award each point only once

<u>data corruption and data loss</u>

viruses -use anti virus software, firewalls, no Internet access

power loss	–	back-ups, UPS
malicious damage	–	back-ups, password protection, controlled access
computer crash	–	back-ups, parallel computer (systems)
damage to CDs/disks	–	back-ups
operator error	–	training / good user interfaces

<u>illegal access</u>

hacking/unauthorised access	–	passwords, log-in ids, anti-hacking software (physical) lock room/computer
computer left logged on	–	log off when not in use, lock computer [6]

5 **1** mark per description, **1** mark per advantage, **1** mark per disadvantage

Direct – old system stopped and next day new system started
Advantage:
- benefits are immediate/less time wasted
- reduced costs (only one system so fewer staff)
- less likely to malfunction since fully tested

Disadvantage:
- disastrous if new system fails/no fall back option

Parallel – old system and new system are run together for a time
Advantage:
- if new system goes down, have old system as back up
- can gradually train staff/have time to get used to new system

Disadvantage:
- more expensive/time consuming since 2 systems run together

Pilot – new system introduced into only part of the company
Advantage:
- if new system fails, only that part affected (rest is alright)
- can gradually train staff/have time to get used to new system

Disadvantage:
- time consuming (waiting to see how new system works)

Phased – part of the new system introduced and when it proves to work another part is introduced, etc./introduced part by part
Advantage:
- only a small part of the operations is affected if new system fails
- no need to pay two sets of wages (so cheaper)
- can ensure system works properly before expanding

Disadvantage:
- time consuming (each part needs to be tested before expanding) [6]

6 **(a)** Any **three** from:

- keyboard (type in the responses)
- touch screen (select options from on screen menus)
- mouse/trackerball/touchpad (click on options from a menu)
- microphone (speak options)
- data gloves/goggles
- camera [3]

(b) Any **three different** devices + associated application areas, e.g.:

– bar code reader	– stock control
	– library systems
– OMR/mark sensing	– multi-choice papers
	– questionnaires
– touch screens	– information desks/kiosks
	– choosing goods on line
– sensors	– monitoring chemical plant
	– central heating systems
– cameras	– traffic control
	– security
– MICR	– reading bank cheques
	– reading travellers cheques
– microphones	– telephone systems
	– games
– magnetic stripe reader	– reading credit cards
	– reading security cards
– data loggers	– weather monitoring
	– collecting experimental data
– OCR	– reading in documents
Scanner	– scanning in photos etc.

[6]

7 Any of the following **three** stages:
- each time item is bought, bar code scanned (at POS)/use of bar codes
- bar code searched for on database/file
- number in stock reduced by 1
- when stock level $\leq$ re-order level/minimum level ……
- …… automatic re-ordering carried out
- when new stock arrives, stock levels updated

[3]

8 **(a)** Any **three** from:
- 3D visual world
- created by a computer
- form of computer simulation
- data gloves used
- data goggles/headsets used
- hardware/motors to provide movement
- special suits fitted with sensors

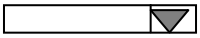
[3]

(b) Any **two** from:
- safety (e.g. can "view" inside a nuclear reactor)
- feeling of "being there"
- can perform "actual tasks" beforehand (without risk)
- less expensive (IF QUALIFIED!!)

[2]

(c) Any **one** from e.g.:
- (medical) training
- walk throughs (e.g. virtual tours of a house)
- simulators (e.g. flight)
- 3D arcade games
- investigating problems in nuclear/chemical plants

[1]

9 (a) Any **two** points from:
- e.g. choose  by clicking on an arrow
- limited number of options available
- highlights option chosen
- use of pointing device to select an option [2]

(b) (i) Any **one** from:
- used where limited number of options exist
- e.g. names of countries, days of month, date of birth

(ii) Any **one** from:
- cannot be used where "infinite" number of options exist
- e.g. addresses, people's names [2]

10 (a) Any **two** differences from:

compiler	interpreter
– needs to be re-compiled every time a change is made	– translates instructions one at a time ….
– code can be executed on its own	– then executes the instructions immediately
– translates whole code in one go	– only finds errors as each instruction executed
– translates source code into object code/machine code	– easier to edit/debug
– produces error list at end of compilation	

[2]

(b) Any **one** high level advantage and any **one** low level advantage:

high-level language

- fewer instructions
- no need to understand registers/computer architecture
- instructions nearer to human language/English
- not machine specific/portable
- easier to debug programs
- easier to write programs

low-level language

- gain knowledge of how a computer works
- more control over how registers (etc.) are accessed
- can access registers (etc.) directly [2]

(c) Any **one** from:
- program/algorithm broken down into simpler modules/smaller tasks
- each module is further sub-divided until basic elements produced
- allows several programmers to work at same time on the software
- can test each module independently [1]

11 **(a)** = AVERAGE(B5:F5) or
= AVERAGE(B5,C5,D5,E5,F5) or
= SUM(B5:F5)/5 or
= (B5+C5+D5+E5+F5)/5 [1]

(b) = MAX(B5:F5)
or
= MAX(B5,C5,D5,E5,F5) [1]

(c) G4, (H4) [1]

(d) – add column between F and G/insert column before G/insert column after F
– change the formula(s) to allow 2010 data to be added [2]

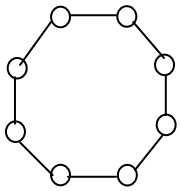
12 1 mark for each error identified + 1 mark for each suggested correction

– error
line 5: **numberpeople < 2** is incorrect
correction:
numberpeople > 2

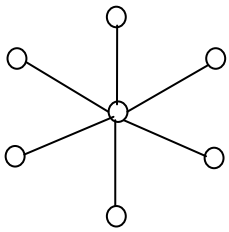
– error
line 6: the formula/**charge = extracost** is incorrect
correction:
charge = extracost + charge

– error
line 7: discount calculation/**charge = charge * 0.1** is incorrect,
correction:
charge = charge * 0.9 [6]

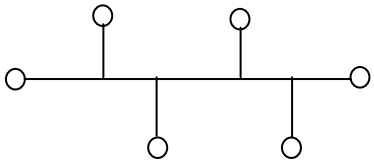
13 (a) Any **two** from:



Ring



star



bus [2]

(b) **One** mark per advantage given:

Ring

– can create much larger networks
– faster/better operation under heavy workload
– requires less cabling than a STAR network, for example

Star

– easy to install and wire/expand
– no disruptions to network if terminal fails
– easy to detect faults in the system
– central monitoring and network management possible

Bus

– failure of single terminal doesn't affect entire network
– easy to connect a new terminal to the network
– requires less cabling, therefore less expensive than others [2]

14 (a) Any **four** points from:
– flow sensor / temperature sensor ….
– …… send information / signal / data to microprocessor
– ADC converts data/signal (for microprocessor to understand/process)
– microprocessor compares flow rate/temperature with pre-set values
– sends signal to valve/heater to control flow rate/temp as required
– use of a DAC interface
– use of actuators
– system loops continuously until switched off [4]

(b) Any **one** from:
– fail safe/switches off automatically
– temperature automatically sets to cold/switches off the heating
– flow cuts off and temperature sets to cold

(NOT a warning light/buzzer comes on) [1]

(c) Any **one** from:
– more accurate control
– safer system
– more energy efficient [1]

15 (a) 12 [1]

(b) US1,US2 [1]

(c) (Country = "China") OR (No. of Floors > 80)
←-------1 mark -----→ ←-------- 1 mark --------→

(No. of Floors > 80) OR (Country = "China")
←-------1 mark -----→ ←-------- 1 mark --------→ [2]

(d) (i) range check, character check, length check

(ii) character check, type check, length check, format check [2]

(e) TA1, CH2, CH1, DU1, MA1, TA2, CH3, CH4, CH5, CH6, US1, US2

(any order) (any order) [1]

16 (a) Any **two** from e.g.:
- electronic checkout
- shopping basket
- ability to track status of order on line
- secure buying using credit cards
- "when customer bought X, they also bought Y" facility
- search facilities for items
- recognise customers as soon as they log on
- drop down boxes to choose categories
- sales confirmation by automatic email
- save customer details/customised pages
- online help facility
- hyperlinks to other pages
- ability to bookmark/tag page(s) [2]

(b) (i) Any **one** from:
- process of changing/scrambling/encoding data into a meaningless form
- use of software/algorithms to turn data into a meaningless form [1]

(ii) Any **one** from:
- to avoid data being read/understood by hackers/unauthorised people
- to protect sensitive data from unauthorised people [1]

(c) Any **one** from:
- viruses being downloaded from the site
- bogus/fake sites
- "unwanted sites"/porn sites coming up when searching
- unsolicited mail
- "cookies" (etc.) being stored on hard drive (spying software)
- hacking [1]

17 (a) Any **two** advantages from:
- always "on"/no need to dial into ISP
- connection rate much higher (e.g. 11000 kbps cf 60 kbps)
- flat monthly rate (dial up charges based on number of hours used)
- can use phone line at same time/line not tied up
- allows other facilities such as VoIP
- download rate is much faster [2]

(b) Any **one** advantage and any **one** disadvantage from:

Advantages
- can use anywhere within range
- no trailing wires

Disadvantages
- range can be limited
- possible interference from electronic devices
- security/tapping into WiFi networks
- (often) slower access speed than wired systems [2]

(c) Any **one** from:
e.g.

- printers
- keyboard
- mouse
- cameras
- mobile phone
- GPS [1]

18 Marking points (maximum of 7 marks)

- initialising highest and lowest to reasonable values (must **not** be zero)
- first loop controlling one year (365 days)
- re-setting total for **each** day
- second loop controlling readings taken **per day**
- read temperature
- calculate total day temperature
- calculate total year temperature
- identifying highest temperature
- identifying lowest temperature
- finding average temperature for day
- finding average temperature for year
- output average day temperature inside loop
- output highest, lowest, average outside the loop

Sample algorithm in pseudocode

```
highest = -100: lowest = 100: total_year = 0                } 1 mark

for c = 1 to 365                                            } 1 mark

    total_day = 0                                           } 1 mark

    for d = 1 to 10                                         } 1 mark

        read temp                                           } 1 mark

        total_day = total_day + temp                        } mark

        total_year = total_year + temp                      } 1 mark

        if temp > highest then highest = temp               } 1 mark

        if temp < lowest then lowest = temp                 } 1 mark

    next d

    average_day = total_day/10                              } 1 mark

    print average_day                                       } 1 mark

next c

average_year = total_year/3650                              } 1 mark

print highest, lowest, average_year                         } 1 mark    [7]
```