UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the May/June 2008 question paper

9691 COMPUTING

9691/03 Paper 3 (Written Paper 3), maximum raw mark 90

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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1 **(a)** -Database held as a single table
-Comprises records of information…
-relating to physical items
-and fields within the records
-each record containing the same fields
(1 per -, max 3) [3]

(b) -Reduced data duplication…
-because data can be cross referenced using foreign keys
-Improved accuracy of data…
-because changes made more easily
-Improved data integrity…
-because reduced duplication means fewer clashes
-Improved data security (privacy)…
-because DBMS will control access by users more easily
-Improved understanding by users…
-because different users can be given different views of the data
(max any 6) [6]

2 **(a)** **(i)** -Parallel/both systems used simultaneously/in order to compare results
-Phased/part of new system introduced/other parts only introduced when first has been fully tested, learned/horizontal introduction
-Direct/old system removed, new system started up/no overlap of systems/no fallback
(Up to 2 per -, max 6) [6]

(ii) Either:
-Parallel
-allows full testing to ensure doctors are satisfied with new system/patient records not lost if new system fails
Or:
-Phased
-e.g. allows doctors to get used to computerised patient records before moving on to prescribing of drugs
(1 per -, max 2) [2]

(b) -Restricted access/keeps patient records secure/sensitive nature of data/less chance of hacking
-Limited volume of data/makes searches simpler, quicker/all data is relevant
-Only relevant people have access/so communications can be considered secure/any comments on the intranet can be considered relevant, accurate, informed
(max 4) [4]

3 (a) (i) -Pressure sensor/on front of robot to tell processor that a solid object has been
-Radar or Sound or Sonar/to build up a picture of surroundings/to warn when so
is in front of robot
-Infra red/light sensor/to detect light intensity which will warn robot of change
surroundings/to warn when something is in front of robot
-Sound sensor/may hear human or other machine approaching
(Up to 2 per -, max 2-, max 4) [4]

(ii) -Decisions must be taken immediately...
-because the environment it is working in is real time. [2]

(b) -Production line/don't have to pay a robot/able to work in 'difficult to reach situations'/more accurate/reliable/work 24,7/no support structure needed
-Dangerous situation like nuclear reactor/robot expendable/too dangerous for human activity
-Micro work/robot is completely accurate/human would not be able to do work to such tolerances
-Situation requiring speed of reaction/human takes too long to react/plan course of action
(1 per application + 1 per reason, max 2 applications, max 4) [4]

4 (a) (i) 01011101
(1 per nibble) [2]

(ii) 135
(1 for 1, 1 for 35) [2]

(iii) 5D
(1 per digit) [2]

(b) (i) -Group the bits in threes
-from the LSB
-Change the binary groups to denary
(1 per -, max 2) [2]

(ii) -Groups of 4 bits
-Give hexadecimal values [2]

5 **(a)** 1 Requirements of hardware need to be standardised in order to allow comp... worldwide/these include connectors/communication medium/compatibility of per... with computer system/software similarities mean no problems with compatibility bet... files

2 File format must match or receiving computer will read received file in the wrong 'language'/text only and rich text files (allow one mark each if they are explained)/others explained

3 Need to match rate of communication/match type of communication – simplex, duplex/ parallel, serial/mention common protocol between devices/matching of rules/layering means that many peripherals can be serviced on the same system

(max 6 points, one from each of the three groups + any other three points) [6]

(b) -Too much power in hands of those whose standards are adopted
-Stifles innovation
-Puts those with no standard systems at a disadvantage
(1 per -, max 2) [2]

6 **(a)** **(i)** The address of the next instruction [1]

(ii) -Originally set to point to first instruction in the program
-After the contents have been used/passed to memory address register (MAR)
-PC is incremented
-If the current instruction is a jump instruction (whose conditions are met)...
-then the PC is reset to the address in the instruction
(1 per -, max 4) [4]

(b) -Holds the address of next instruction...
-when passed from PC
-Holds the address of data location to be accessed...
-when passed from CIR
-Holds the address of memory location currently in use
(1 per -, max 4) [4]

7 **(a)** 15,3,8,10,1

Compare 3 with those before	3,15,8,10,1
Compare 8 with those before	3,8,15,10,1
Compare 10 with those before	3,8,10,15,1
Compare 1 with those before	1,3,8,10,15

Mark points:
-Compare each number in turn...
-with those before it...
-to find its final place in list...
-starting with second in list...
-ending with final answer
(1 per -, max 4. Note: 4 marks for showing stages with this example) [4]

(b)

1st List	2nd List	Compare	New List
2,4,7,9	1,3,8,10,15	2,1	1
		2,3	1,2
		4,3	1,2,3
		4,8	1,2,3,4
		7,8	1,2,3,4,7
		9,8	1,2,3,4,8
		9,10	1,2,3,4,8,9
		Copy remaining	1,2,3,4,8,9,10,15

Marks points:
Clearly show:
-First from each list compared...
-smallest in new list...
-and replaced by next from its original list
-Repeat until one list empty
-Copy remains of other list to new list
(1 per -, max 4. Credit above points from an example) [4]

8 **(a)** -When more than one program resident...
-and requiring processing...
-the operating system uses scheduling to decide on processing to be done
-Allocation of processing...
-in a multi-access/multi programming environment
-to be 'fair' to all programs/users
-to use the peripherals wisely
-to prevent system failure
-maximise use of processor
(1 per -, max 2) [2]

(b) -FCFS/first job to enter ready queue is first to enter running queue/favours long jobs
-SJF/sort jobs into time expected to run, shortest first/new jobs place in queue in correct order
-RR/gives time slice to each job in turn/after slice job returns to back of queue
-SRT/jobs sorted according to run time left to do/long jobs may never be done
-MLQ/involves a number of queues/jobs migrate through the queues according to importance
-PD (peripheral dependency)/non peripheral dependent jobs given low priority
(2 per -, max 3-, max 6) [6]

9 **(a)** -Reserved word is isolated...
-if not in list of reserved words (then error)
-(If reserved word identified then syntax table) checked for expected form of statement...
-matched to statement provided and error issued if different
-Variable names checked against rules for variable names
-Check for variable declarations
(1 per -, max 4) [4]

(b) -All errors due to incorrect use of language have been corrected
-When variables are first met in code generation, an address is assigned to them
-Intermediate code is produced
-Machine code/executable code produced (from intermediate code)
-Optimisation of code carried out
(1 per -, max 4) [4]

10 **(a)** **(i)** -A particular fact that fits the rule
-e.g. If fresh (X) then guppy is an instance of X/X is instantiated to guppy [2]

(ii) -The intention to find all instances that satisfy a rule/fact
-e.g. If rule is fresh (X) then the goal is to find guppy, roach [2]

(iii) -If the result of one rule does not apply in a second rule, then go back to find another result of the first rule
e.g. -find a salt water eater of roach
-eats (guppy, roach) is found
-fresh (guppy) shows guppy is a fresh water fish
-eats (salmon, roach)
-salt (salmon) shows salmon is a salt water fish
-salmon satisfies the rule
(1 per -, max 4) [4]