UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9691 COMPUTING

9691/32   Paper 32 (Written Paper), 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, 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.

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1 (a) -Interpreter translates one command and runs it before translating the next
  -Compiler translates whole program before it is run
-Interpreter maintains source code throughout run
  -Compiler creates the object code and drops the source code
-Interpreter must be present in memory during program run
  -Compiler no longer needed once object code created/can be removed
-Compiled program will be longer than source code
-Compiled program will tend to run more quickly
  -because no further translation is required
(1 per -, max 6) [6]

  (b) (i) Lexical analysis and Syntax analysis [2]

  (ii) -Creates a machine-code program/object code...
    -which is equivalent to the high level language program
    -The code which is created will not be efficient
    -Optimisation is used...
    -to reduce the number of commands in the object code...
    -by removing redundant code/substituting one command for several (according to set rules)
    (1 per -, max 3) [3]

2 (a) (i) -ID number input
    -Read next record from TF
    -Compared to ID number from record
    -If a match found then record details are output
    -If not end of TF then repeat from second mark point
    -If no matches then report error
    (1 per -, max 4) [4]

  (ii) -Flag created/Boolean variable/condition statement in loop
    -set to 1 or true when match found
    -no further comparisons carried out/search would end as soon as one match was found
    (1 per -, max 2) [2]

  (iii) -Compares centre record with input value
    -If no match, half of remaining file is removed
    -Repeat until ID number is found
    -Need to compare above and below found record because of multiple records
    (1 per -, max 3) [3]

  (b) -Insert first value/36721
    -Read next value and insert in correct place in list/36721, 53967
    -Repeat until no more values/24378, 36721, 53967
                    24378, 36721, 47869, 53967
                    24378, 36721, 47691, 47869, 53967
    (1 per -,) [3]

3 (a) -Touch/infra-red/ultra-sound/radar sensor
      -to detect obstacles
  -Light sensor
      -to follow predetermined track on floor
  -Weight sensor/pressure sensor
      -to determine when the car has had a component added to it
  -Pressure sensor
      -to show that collision has occurred
  (1 per -, max 2 pairs, max 4)   [4]

(b) -Paint sprayers
      -arm is programmed to follow a series of actions
      -in predetermined sequence
  -Carrying parts around factory
  -Welders
      -to fix body panels to each other
  -These applications stop a human having to be in a hazardous environment
  -They ensure a high/consistent standard of work
  -Greater precision in work
  -They work continually without breaks
  -Effect on human workforce
  (1 per -, max 6)   [6]

4 (a) -A single table...
  -rather than a set of related tables/linked tables
  -Flat files allow only a simple 2D structuring of data
  (1 per -, max 2)   [2]

(b) -Reduced data duplication
      -Most data items stored once
      -Because tables are linked contents of any table can be accessed from one
  -Improving data privacy
      -Access can be easily controlled
      -Users have their own views of the data
      -Views controlled using access rights
  -Improved data security
      -Regular/automatic backups of data made as part of DBMS
      -Data protected from misguided/malicious processing or alteration
  -Improved data integrity
      -Less chance of contradictory data
  -Improved/simpler search techniques
      -Using facilities provided by DBMS
  (1 per -, max 2 per type, max 3 types, max 6)   [6]

5 -Bus because, e.g. of simplicity and speed not important
-Ring because, e.g. simple but fewer collisions than bus
-Star because, e.g. of increase in performance/more reliable/greater security
-Cables can be used because school is new and can be cabelled properly
-Use of UTP/Twisted pair/Fibre optic/Coaxial (minimum of two types)
-Low level of traffic may point to UTP or twisted pair
-Length of cable points away from coaxial
-Fibre optic is high speed
-Use of wireless media...
-allowing physically unrestricted access across site.
(1 per -, max 6)   [6]

6 (a) -Pages are fixed size/rely on physical divisions
-Segments are variable size/are based on logical divisions
(1 per -, max 2)   [2]

(b) -Index of pages is maintained...
-If an instruction is to be executed it must be in main memory
-When page is completed it can be over-written...
-by the next page to be accessed...
-which may be stored in virtual memory
-which allows faster access than simply from storage
-Virtual memory is using backing store to act as memory
-Page management table...
-used to keep track of where in memory the pages are stored
-Pointer to next page
(1 per -, max 6)   [6]

7 (a) -Many lose jobs
-Many will need training for new tasks
-Will reduce the dangers to people on production line
-Semi-skilled jobs will be done by robots/computerised/example
-Skilled jobs enhanced/become checker/tester/example
-Non skilled jobs unaffected/keeping factory clean/example
-New jobs maintaining systems
-Workforce performance monitored by computer systems
-May lead to stress in workplace
(1 per -, max 4)   [4]

(b) -Quality should improve because robots more precise
-Quality should become consistent/easy to test production
-Cannot cope easily with one-offs
-May not spot faulty materials supplied.
(1 per -, max 2)   [2]

8 (i) -The address in memory of the data/instruction to be accessed
-Can be changed by contents of PC being copied into it
-Can be changed by memory address being copied to it from CIR
(1per -)

(ii) -The data/instruction to be used
-Is changed every time an address in MAR is accessed
-Stores data from Accumulator on its way to being stored in memory.
(1 per -)   [3]

(iii) -Stores an instruction...
-while it is being decoded/executed/carried out
-Contents change when an instruction from memory has been placed in MDR, and then it is
 copied from MDR to CIR.
(1 per -)   [3]

9 (a) -System1 response time will be immediate/real time
-as the customer must wait until processing is done
-System 2 will be batch processed/data is collected before processing
-the system outputs are not time critical
(1 per -, max 3)   [3]

(b) Hardware:
-Either need storage device/hard disk
-System 2 may copy final details to removable storage for backup.
-System 1 needs bar code reader/keyboard for input
-System 1 needs screen/printer/sound for output

Software:
-System 1 requires file handling software/small amount of arithmetic software
-Software 2 requires file sorting/merging software
-Software 2 requires stock control software
-System 2 requires communications software for automatic ordering

Data Structures:
-System 1 must have direct/random access to file
-System 1 has array/list of customer purchases in order to produce receipt
-System 2 must have sequential access to file
-Transaction file must be in serial form/sorted into sequential order
-Database for products/stock
(1 per -, max 8)   [8]

10 (a) (i) . is not defined

(ii) an integer must not begin with a zero

(b) <REAL>::=<FIRST><POINT><NUMBER>│<FIRST><POINT>
<FIRST>::=<INTEGER>│<ZERO>
<POINT>::= .
<ZERO> ::= 0

Mark points:
-Definition contains . (point)/Definition contains 0
-Definition has integer OR 0 before the point AND number or nothing after the point
-Correct use of notation
(Note: No marks for redefining meta variables given in question)
-Definition of zero   [3]

(c)
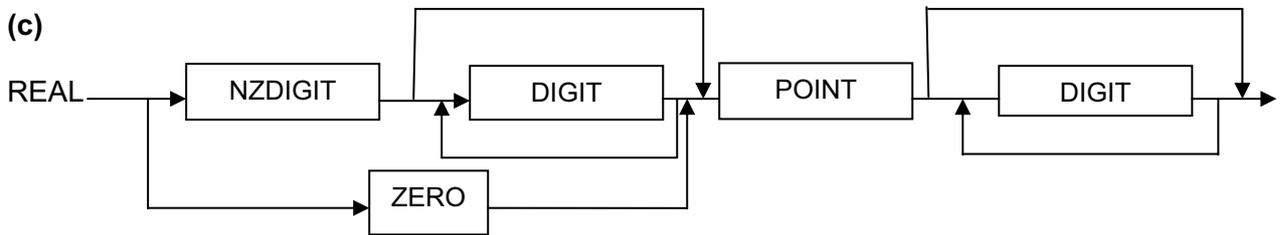
Mark Points:
Before point:
-Allows only 0
-NZ Digit alone
-NZ Digit AND unlimited digits
After point:
-Possibility of no digits
-Unlimited digits
(1 per -, max 4)   [4]