UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Diploma Advanced Level

MARK SCHEME for the October 2007 question paper

CAMBRIDGE INTERNATIONAL DIPLOMA IN COMPUTING

5218   Further Systems and Software, Maximum 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   Phased
    – Would mean introducing a small part of the system (perhaps fares<$1) on all buses
    – Not feasible to have two different methods of payment on each bus
    – Very expensive because all buses must be equipped
    Pilot
    – Would mean the system is introduced on a few routes
    – Means that testing can be done rigorously without risk to most of network
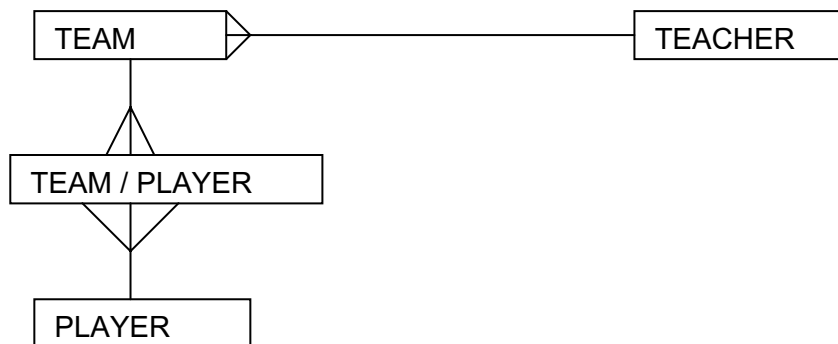   – Bus operators can be trained
    Direct
    – All buses equipped and new system operates immediately
    – (Very expensive) and risky/no obvious benefits
    – Staff would need to be trained before implementation
    (1 per –, max 2 per implementation type, max 6)   [6]

2

    Mark points:
    – Three original entities
    – Link entity with acceptable name
    – Relationship Team to Teacher
    – Relationship Team to Player as many to many
    – Relationship Team to Link as one to many
    – Relationship Link to Player as many to one
    (1 per –, max 5)
    – At least one relationship descriptor   [6]

3   – Cheap advertising/advertising via website
    – to reach a large audience
    – Users may order goods and…
    – pay for them…
    – reference to need for security of communication/method of securing communication
    – Communication between outlets…
    – allows for centralised warehousing/distribution
    – Communication with customers
    – Communication with suppliers
    – Users at all levels can have access to their accounts
    (1 per –, max 6)   [6]

4　– Easily accessible at any time or place
　　　– following use of portable systems/less privacy when off duty
　　– More communication
　　　– because easier to send to multiple recipients
　　– Communication can be instantaneous
　　　– because of email
　　– Large files of data can be easily communicated
　　　– can be used from home
　　– Security procedures make the transport of data safe
　　　– can be used from anywhere the user is
　　– Less need to travel into office
　　　– can work from home
　　– More chance for planning own working time
　　– Help with work available anywhere/time
　　(1 per –, max 5)　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[5]

5　**(a)** – I/O interrupt
　　　　– printer out of paper or not connected
　　　– Timer interrupt
　　　　– processor has used too much time on one process/do something else
　　　　– time share system
　　　– Hardware
　　　　– power failure/allow I/O interrupt example
　　　– Software
　　　　– invalid instruction attempted/division by zero
　　(1 per –, max 2 pairs, max 4)　　　　　　　　　　　　　　　　　　　　　[4]

　　(b) – Present cycle completed
　　　– Priority of interrupt…
　　　– compared with priority of present task
　　　– If <u>lower</u> priority then stored in job <u>queue</u> in relevant <u>position</u> for its priority
　　　– (If higher) then contents of registers stored…
　　　– on stack
　　　– Interrupt routine found and run
　　　– When complete, next highest priority run
　　　– Mention/description of vectored interrupts
　　(1 per –, max 5)　　　　　　　　　　　　　　　　　　　　　　　　　　　[5]

6　**(a)**　　　　　　　　　　　　　DAMON

　　　　　　　　　　　　CANDU　　　　　RISH

　　　　　　　AAMON　　　　　GLAN　　　　TENAR

　　(1 per level)　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[3]

　　(b) – Traverse left subtree
　　　– Write down node
　　　– Traverse right hand subtree
　　　(1 per idea, accept line drawn on diagram if obvious order and note made of when readings
　　　taken)　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[3]

7   – Characters in the variable name are tokenised
      – Variable name is added to symbol table…
      – during lexical analysis
      – Data type added…
      – scope is added/block(s) in which variable is valid
      – during syntax analysis
      – Variable names which do not match the rules are reported in error diagnostics
      – Statements containing variables are checked for syntax
      – Position in table is hashed from the name
      – Variable declarations are checked/also variable use
      – Address of variable calculated…
      – added to symbol table…
      – during code generation
      (1 per –, max 6)   **[6]**

8 **(a)** – e.g. Weather forecasting
           – requires large number of calculations
           – The results being time sensitive
           (1 per –, max 3)   **[3]**

    (b) – Special operating system (to control)…
           – several processors simultaneously…
           – array processor
           – Specially written/non serial, (application) software
           (1 per –, max 3)   **[3]**

9 **(a)** – Holds the address in memory from which data is to be taken/accept 'Address of instruction'
                          [1]

    (b) – Content of PC is copied into MAR
           – MAR holds the address of the next instruction to be processed
           – Operand part of instruction is copied into MAR from the CIR (possibly via intermediate step)
           – Holds the address of the data needed to complete the processing of that cycle
           (1 per –, max 4)   **[4]**

10 **(a)** Bit headings: –1   (1 mark)
                       ½, ¼, 1/8, 1/16   (1 mark)
                       –4   (1 mark)
                       2, 1   (1 mark)   **[4]**

    (b) 2 ½ = 10.1
                 = 0.101×2^{10}
                 = 01010010 (On its own, worth 2 marks)
           Normalised because first 2 digits are different.
           (1 per line, max 3)   **[3]**

    (c) 10100000
           (1 for first 5 bits, 1 for last 3 bits)   **[2]**

11 (a) (i) – Third generation high level languages
– Problem orientated/designed to solve specific types of problem
– Describe (step by step) how to solve a problem
(1 per –, max 2) [2]

(ii) – Fourth generation high level languages
– Program told what the problem is/rather than steps necessary to solve it
– Searches database according to rules supplied
(1 per –, max 2) [2]

(b) (i) – Data can only be accessed using specific methods…
– provided by the class
– Objects cannot be corrupted by the user
(1 per –, max 2) [2]

(ii) – One class can include the data and methods of another…
– plus some of its own
– Allows for simple reuse of code/extension of original data and methods without affecting the code.
(1 per –, max 2) [2]

12 (1) – Software tool to draw Gantt charts
– Standard Gantt templates
– Can be used to show tasks to be done
– Duration of tasks may be inserted/edited
– Parallel tasks are identified
– Dependency of one task on others
– Resource loads are automatically identified
– Project progress can be continually superimposed for monitoring purposes

(2) – Software tool to draw Critical Path Analysis diagrams/PERT
– Network can be validated automatically
– Earliest start
– Critical path established
– Latest finish
– Bottlenecks identified
– Changes implemented and consequences updated automatically
– "What ifs" can be considered
– Gives duration of project
– Evaluation of float time
– Shows which stages can be done simultaneously
(1 per –, max 5 per type, max 8) [8]
(NB Not CASE/documentation tools/program generators)

13 **(a)** – Bus/Ring/Star topologies (mention of 2)
– Bus because simplicity and speed not important/allows easy additions to network
– Ring because (still simple) but fewer collisions
– Star because small example and vast increase in performance/increases security of data/network
– Three LANS necessary for security reasons
– Three LANS connected by bridges/routers to allow intelligent directing of data
– UTP/twisted pair/fibre optic/coaxial/wireless
– Sensible are either UTP or twisted pair or wireless because of low level of traffic
(1 per –, max 8)   [8]

(b) – Each user has an ID
– and password to prove ID
– Giving each user access to their own rights on system
– Mention of hierarchy of passwords
– Mention of physical measures
– Mention of identifying machine being used
(1 per –, max 2)   [2]