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MARKSCHEME

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COMPUTER SCIENCE

Standard Level

Paper 1

12 pages

SECTION A

1. *Syntax* = mistake in the use of programming language ***[1 mark]***.
Logical = use of language OK but result not intended result ***[1 mark]***.
Run-time = error which only appears during operation ***[1 mark]***.

2. Cheap ***[1 mark]*** OR large ***[1 mark]***
Non-volatile ***[1 mark]***.

3. Verification ***[1 mark]***

4. Results are generated fast enough (accept "immediately") ***[1 mark]*** to influence the next input/process ***[1 mark]***.
Do not accept 'on-line'.

5. 1 ***[1 mark]***

6. Any two from

– While (...do)
– Repeat (...until)
– For (...do)

for ***[1 mark]*** each up to a maximum of ***[2 marks]***.

7. – Coordinates ***[1 mark]*** the execution of the software ***[1 mark]***
– Carries out ***[1 mark]*** the fetch execute cycle ***[1 mark]***

8. *(Award **[1 mark]** for the idea that it (is hardware/software combination that) connects networks together; idea that it directs date to the appropriate path.)*

9. *(Award **[1 mark]** for a correct stage, and a second mark for a correct elaboration, up to a maximum of **[6 marks]**.)*

– Systems analysis, an investigation which leads to a precise statement of the problem;
– Software/program design, a breakdown of the problem statement into its constituent parts from which coding can take place;
– installation/operation, the introduction of the system so that it can be used by the end-user;
– maintenance, where the system is checked for errors/improvements which will lead to another cycle;
– documentation.

10. *(Award marks as follows, up to **[2 marks]** maximum:)*

– When sending data over a network ***[1 mark]*** if a validation/error check detects an error ***[1 mark].***
– A transmission check, *e.g.* parity, comparison of double send ***[1 mark]*** may find an error ***[1 mark].***

11. *(Award the marks as indicated below; up to **[4 marks]** max:)*

– A function should return one value;
– which is returned by the function name/itself;
– parameters should not change/no “side-effects”;
– since this would mean more than one value is returned;
– so there is no need for pass-by-reference parameters;
– which can be changed;
– unlike pass-by-value parameters (which can’t be altered);
– so pass-by-value parameters should be used;
– unless pass-by-reference parameters are used to save memory;
– and the values are not changed.

12. *(Award **[1 mark]** for identifying a suitable advantage other than speed-related, and **[1 mark]** for a further correct elaboration, and **[1 mark]** for identifying a suitable disadvantage, and **[1 mark]** for a further correct elaboration, up to a max of **[4 marks]**.)*

ADVANTAGES:
- Security:
  - email will only deliver to the specified address (whereas normal mail could be opened by another person); or
  - email addresses usually require a password to access it (whereas physical mail can be opened by another person);
- Economy:
  - in most countries the cost of a local call is cheaper than the international mail rate;
- Convenience:
  - the mail can be sent without having to move from the computer (unlike a letter which needs to be packaged, weighed, correct stamps bought *etc.*);
  - can send pictures and sound in computer readable format.

Do NOT accept:
- Multiple sendings: the same email can be sent to a group of people. (So can a document, *i.e.* photocopy it!) This idea CAN be accepted IF the candidate explains that it would save the inconvenience of photocopying *etc.*, because then it's the previous point!
- Attach and send replies *etc.* because this can be done with physical documents; *i.e.* don't accept tasks that are equally valid with paper documents.

DISADVANTAGES:
- The original document is not received:
  - this may be required in some cases (*e.g.* legal contracts);
- No physical items can be included:
  - additional articles cannot be included such as a product sample (or even separate handwritten notes *etc.* - see next point);
- Personalised notes may be lost:
  - although notes *etc.* can be scanned and so the original layout/format/colour maintained, this is more difficult than simply enclosing original notes/letters and so personal comments/intimations may be lost. (Accept the more concrete "this cannot be done" from a candidate, as well as the correct "more difficult")'
- Can mistakenly send viruses:
  - examples of damage caused by viruses.

SECTION B

13. (a) Boolean. ***[1 mark]***

(b)

HALF	MIDDLE	POSITION	SAME	COUNT	
3	4	1	true	1	***[1 mark]***
		2	false		***[1 mark]***
		3	true	2	***[1 mark]***

(c) *(Award **[2 marks]** for a complete explanation, **[1 mark]** for a partial answer.)*

Complete answers:

It counts the number of values that are equal ***[1 mark]*** at equivalent (opposite) locations from the centre ***[1 mark]***.

It tests matching entries from the centre ***[1 mark]***, counting how many are equal ***[1 mark]***.

It tests symmetrical/balancing locations ***[1 mark]*** , seeing how many are equal ***[1 mark]***.

It counts the number of entries which are the same ***[1 mark]*** mirrored about the centre/middle (of the array) ***[1 mark]*** *etc.*

Partial answers:

It counts how many entries make it a palindrome ***[1 mark]***.

It tests if it is a palindrome ***[1 mark]***.

It counts if the ends are equal ***[1 mark]***.

It looks as if it is a mirror ***[1 mark]*** *etc.*

(d) *(Award marks as follows:)*

- ***[1 mark]*** for stating that `COUNT` changes within the procedure;
- ***[1 mark]*** for the idea that it needs to be passed back to (or 'used' by) the calling routine/main program.

(e) (*Award marks as follows, up to a maximum of **[2 marks]**:)*

- ***[1 mark]*** for identifying that a function returns a single value;
- ***[1 mark]*** for stating that since this is what the algorithm does it is appropriate;
- ***[1 mark]*** since there is only one 'out' parameter;
- ***[1 mark]*** and the others are 'in' parameters;
- ***[1 mark]*** the value can be passed back via a function name.

(Check other apparently correct answers with your team leader.)

14. (a) 11111111 ***[1 mark]***

256 colours ***[1 mark]***
Do NOT award any marks for 255, or 0-255.

(b) 00010100 ***[1 mark]***

(Do NOT award any marks for 10100 or 010100 (i.e. it MUST be in 8 bits).)

(c) *(Award **[1 mark]** for identifying a suitable area of standardisation, and **[1 mark]** for a correct elaboration, up to **[2 marks]** max:)*

– Network data/protocols ***[1 mark]***
  – so communication can be "understood" around/between networks ***[1 mark]***;
  – so data can be transferred without translation/conversion; ***[1 mark]***

– (Document/graphic) Files ***[1 mark]***
  – so different packages can import/export documents without problems/conversion. ***[1 mark]***

(d) $30\,000 \times 1230 = 36\,900\,000$ kB

(1 GB = $1024 \times 1024 \times 1024$ bytes)

$36\,900\,000 / (1024 \times 1024) = 35.19$ GB

(Award marks as follows:)
– ***[1 mark]*** for giving answer as 36.9 GB (The idea of relationship between GB and kB is clear.)

– ***[1 mark]*** for ANY attempt at dividing by 1024 instead of 1000 to get final answer.
  – Obviously 35.19 or 35.2 GB is fine (even if 1024 is not seen in the working!);
  – So is 35 GB <u>if</u> 1024 has been shown in working;
  – Accept 36.035 GB without seeing 1024 in the working (this is obtained by initial division of 1024, then by 1000 to get GB);
  – Accept 36 GB <u>if</u> initial division by 1024 is shown on page to get 36035(.156), then directly by 1000.

If answer is left as $\frac{36\,900\,000}{1024 \times 1024}$ GB or even $\frac{(30\,000 \times 1230)}{1024 \times 1024}$ GB give both marks.

(Note that there are NO marks for the initial working of getting 36 900 000!)

(e) *(Award marks as follows:)*

– ***[1 mark]*** for identifying that data compressors reduce storage size (or "saves space");
– ***[2 marks]*** for explaining a correct situation:
  – to transfer data between computers ***[1 mark]*** using a smaller storage medium (*e.g.* floppy disc) ***[1 mark]***;
  – to save space on the hard disc ***[1 mark]*** so that more data/software can be stored ***[1 mark]***. (In fact this statement would get all three marks, *i.e.* "save space" "on the hard disc" gets ***[2 marks]***, then the third for the reason);
  – quicker transfer of data.

15. (a) *(Award **[1 mark]** for identifying an area where a difference occurs, and **[1 mark]** for a correct elaboration, for 2 different areas, giving a maximum of **[4 marks]**:)*

– Production of code ***[1 mark]***: a compiler produces a separate machine code version, unlike an interpreter (which executes as it goes, not saving object code) ***[1 mark]***;

– Input requirements ***[1 mark]***: a compiler needs a complete HLL program, unlike an interpreter which will start with any code until it runs out of statements/error ***[1 mark]***;

– Error handling ***[1 mark]***: a (good) compiler will list all errors in the program, an interpreter will stop and report at first error ***[1 mark]***;

– Program complexity ***[1 mark]***: a compiler is a more complex/"larger" program (because it has more functions *e.g.* optimisation), so requires more memory than an interpreter ***[1 mark]***);

– Final program requirements ***[1 mark]***: once finished and compiled the compiler is not required again to execute the code, an interpreter is required to be loaded/"used" every time the program is executed ***[1 mark]***).

(NOTE: the candidate does not have to specify the area EXPLICITLY as given in the markscheme above. Full marks would be gained by the section after the colon (:) in EACH case, because the area is obvious by the description.)

(b) *(Award **[1 mark]** for a valid item of system documentation and a further **[1 mark]** for a correct statement as to how it would be used in maintenance for two items, giving a maximum of **[4 marks]**.)*

– Program Design/Structure diagrams/Pseudocode ***[1 mark]***
– to show logic so easy to see how to debug/modify/update ***[1 mark]***

– (Anotated) program listing ***[1 mark]***
– so another programmer can use code to debug/modify/update ***[1 mark]***

– description of data structures ***[1 mark]***
– so another programmer can change them/use them in another procedure/add a new field ***[1 mark]***

– test strategy/testing ***[1 mark]***
– so another programmer is aware of data types/format that can be used for alteration/update.

(c) *(Award **[1 mark]** for a valid reason, and **[1 mark]** for a correct elaboration:)*

– ***[1 mark]*** for any mention of a web (or internet) page;
– ***[1 mark]*** for a reason why, *e.g.* to advertise the software company's services; to create a site for a client.

16. (a) *(Award **[1 mark]** for a valid ethical issue, and **[1 mark]** for a suitable elaboration; for two issues, giving a maximum **[4 marks]**:)*

– software piracy ***[1 mark]***, by copying CD-ROMs money is not being given to the proper person (*i.e.* the author) ***[1 mark]***;

– defrauding the company ***[1 mark]***, the employee is stealing from his employer by not using work time properly. (Accept cost of unauthorised phone calls, even though this may not be directly accurate). ***[1 mark]***;

– work spying on employees ***[1 mark]***, it may be seen as intimidating that managers can view every email sent/received by each employee ***[1 mark]***.

(b) *(Award **[1 mark]** for a valid precaution, and **[1 mark]** for a suitable elaboration to give a total of **[2 marks]**:)*

– constant virus checking software ***[1 mark]*** to test all incoming emails (and attachments) ***[1 mark]*** ;

– a firewall ***[1 mark]*** such as ring back connection so that only authorised connections are used ***[1 mark]***;

– (use software to) only accept text emails / ban attachments ***[1 mark]*** because attachments can contain viruses ***[1 mark]***

– Stopping employees bring in their own discs ***[1 mark]*** which might include data for sending in emails ***[1 mark]***. (Accept this last point, even though it is not specific to emails.)

(c) *(Award **[1 mark]** for a valid task, and **[1 mark]** for a suitable elaboration; for two tasks, giving a maximum **[4 marks]**:)*

– training ***[1 mark]*** ; an employee needs to be taught how to access/use the system to reduce errors ***[1 mark]***;

– user-id needs to be added to system log ***[1 mark]*** so that when logging-on the new employee is recognised as an authorised user ***[1 mark]***;

– level of hierarchy needs to be set ***[1 mark]*** so that the new user can only access data that s/he is supposed to ***[1 mark]***.