CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9608 COMPUTER SCIENCE

9608/32 Paper 3 (Written Paper), maximum raw mark 75

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1 (a) (i) 01101000 0011
= 0.1101 (or 1/2 + 1/4 + 1/16) × 2↑3 [1+1]
= 110.1
= 6.5 [1]

(ii) +3.5
= 11.1 [1]
= 0.111 × 2↑2 (or indication of moving binary point correctly) [1]
= 01110000 0010 [1]

(iii) 01110000 Allow f.t. from **(ii)**
10001111 One's complement on mantissa [1]
10001111 +1 Two's complement [1]

= 10010000 0010 [1]

(b) (i) Precision/accuracy of numbers represented will increase [1]

(ii) Range of numbers represented will increase [1]

(c) Any point, 1 mark (max. 3)

0.1/0.2 cannot be represented exactly in binary // rounding error [1]
0.1 represented by a value just greater than 0.1 // 0.2 represented by a value just greater than 0.2 [1]
adding two representations together adds the two differences [1]
summed difference significant enough to be seen [1]
[max. 3]

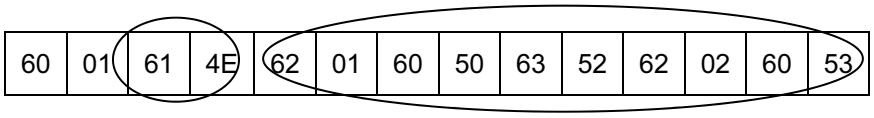
[Total: 14]

2 (a)

Symbol	Token	
	Value	Type
Start	60	Variable
0.1	61	Constant
Counter	62	Variable
10	63	Constant

[1] [1+1]

(b)



[1+1]

(c) **(i)** syntax analysis [1]

(ii) any **two** points from:

construct parse tree // parsing
checking syntax/grammar
produce error report [max. 2]

(d) **(i)** Minimise the execution time // code runs faster [1]

(ii) Compiler could calculate 2*6 and replace it with the value 12. [1]

(iii)
LDD 436 }
ADD 437 } [1]
STO 612 }
ADD 438 [1]
STO 613 [1]

–1 for each additional instruction; 0 for copy of original code

[Total: 13]

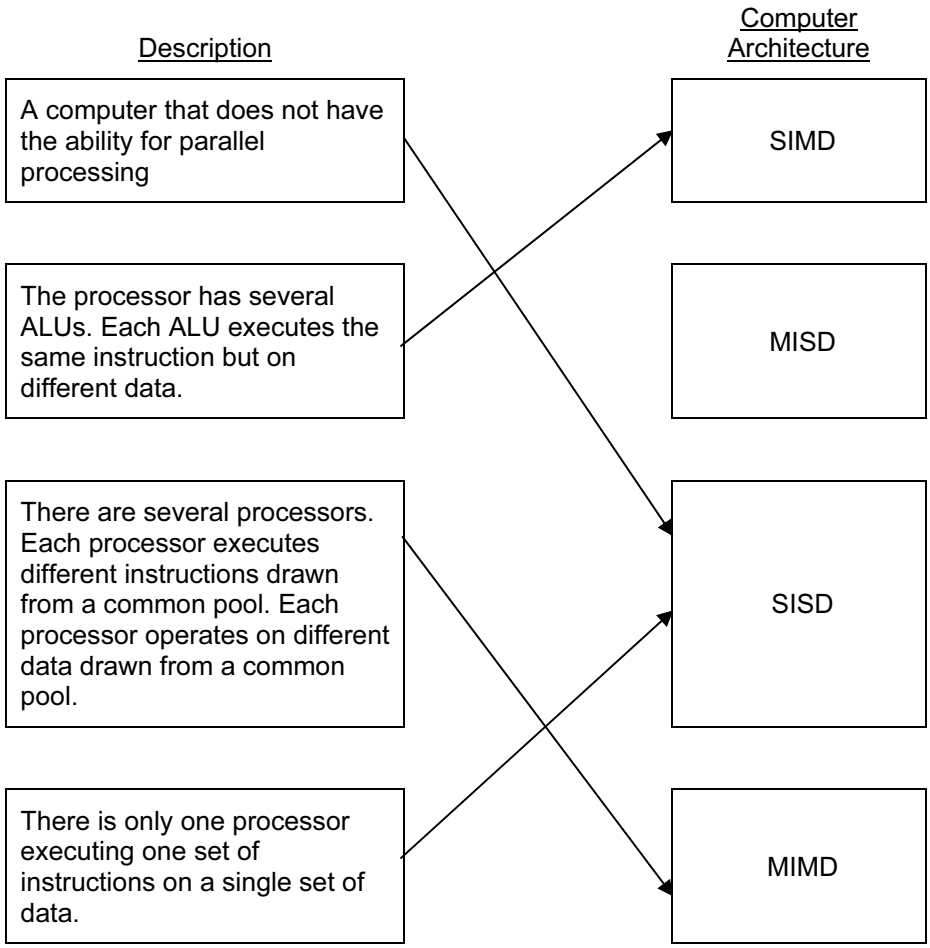
3 **(a)** dedicated circuit/channel/physical path [1]
which lasts for duration of connection [1]

(b) e.g.
cs: gives dedicated circuit [1]
ps: split into packets/chunks [1]
ps: sends packets on individual routes [1]
cs: whole bandwidth available // ps: shares bandwidth [1]
cs: faster data transfer [1]
cs: packets arrive in order they are sent [1]
cs: packets cannot get lost [1]
cs: better for a real-time application [1]
ps: packets may arrive out of order so delay until packet order restored [1]
ps: packets may get lost so retransmission causes delays [1]
[max. 6]

(c) web page divided into packets/chunks [1]
each packet has destination address [1]
router looks at IP address… [1]
and decides where to send packet next for most efficient path [1]
packets can take different routes [1]
home computer reassembles packets to rebuild web page [1]
[max. 3]

[Total: 11]

4 **(a)** 1 mark for correct arrow from each description



[4]

(b) **(i)** **Massive**: many/large number of processors // hundreds/thousands of processors [1]

(ii) **Parallel**: to perform a set of coordinated computations in parallel/simultaneously [1]

(c) processors need to be able to communicate … [1]
so that processed data can be transferred from one processor to another [1]

suitable algorithm/program/software/design // appropriate programming language [1]
which allows data to be processed by multiple processors simultaneously [1]

[**Total: 10]**

5 (a) (i)

$Z = P.\overline{Q}.\overline{R}$ + [1]

$P.\overline{Q}.R$ + [1]

$P.Q.R$ [1]

(ii)

R \ PQ	00	01	11	10
0	0	0	0	1
1	0	0	1	1

[1]

(iii) 1 mark each loop

R \ PQ	00	01	11	10
0	0	0	0	1
1	0	0	1	1

Allow f.t. from **(ii)** [2]

(iv)

$Z =$

$P.\overline{Q}$ [1]

$+P.R$ [1]

Allow f.t. from **(iii)**

(b) (i) 1 mark row headings. 1 mark column headings.
1 mark per 2 correct rows (based on headings)

RS \ PQ	00	01	11	10
00	0	0	0	0
01	0	1	1	1
11	0	1	1	0
10	0	0	0	0

[4]

(ii) 1 mark for loop with two 1s; 1 mark for loop with four 1s

RS \ PQ	00	01	11	10
00	0	0	0	0
01	0	1	1	1
11	0	1	1	0
10	0	0	0	0

Allow f.t. from **(i**
–1 for each incorrect grouping, max. 2 errors [2]

(iii)

$Z = Q.S$ [1]

$+P.R.\overline{S}$ [1]

Allow f.t. from **(ii).** –1 error if more than 2 terms

[Total: 16]

6 (a) blocked → ready:
process is waiting for resource/ I/O operation to complete (blocked state) [1]
when I/O operation completed process goes into ready queue (ready state) [1]
running → ready:
when process is executing it is allocated a time slice (running state) // process is allocated time on processor [1]
when time slice completed/interrupt occurs process can no longer use processor even though it is capable of further processing (ready state) [1]

(b) to be in blocked state process must initiate some I/O operation [1]
to initiate operation process must be executing [1]
if process in ready state cannot be executing/must be in running state [1]

(c) (i) exit/termination/completion [1]

(ii) when the process has finished execution [1]

(d) low-level scheduler:
decides which of the processes in ready state [1]
should get use of processor/be put in running state [1]
based on position/priority [1]
invoked after interrupt/OS call [1]
[max. 2]

[Total: 11]