



Cambridge International Examinations
Cambridge International Advanced Level

COMPUTER SCIENCE

9608/32

Paper 3 Written Paper

October/November 2016

MARK SCHEME

Maximum Mark: 75

Published

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- 1 (a) +3.5**
- 01110000 00000010 [3]
 Give full marks for correct answer (normalised or unnormalised)
- = 11.1 [1]
 = 0.111×2^2 // evidence of shifting binary point appropriately [1]
- [Max 3]**
- (b) –3.5**
- 10010000 00000010 [3]
 3 marks for correct answer
- One's complement of 8-bit mantissa for +3.5 10001111 – allow f.t. [1]
 +1 to get two's complement 10010000 [1]
- [Max 3]**
- (c) 14** [3]
 3 marks for correct answer
- = 0.111×2^4 // exponent is 4 [1]
 = $1110.0 / (1/2 + 1/4 + 1/8) \times 16$ [1]
- [Max 3]**
- (d) (i) Normalised** [1]
- (ii)** Leftmost two bits are different for normalised representation
 // because the pattern starts with 01 [1]
- (e)**
- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|
- [1]
[1]

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2 (a)

Statement

This stage can improve the time taken to execute the statement:
 $x = y + 0$

This stage produces object code.

This stage makes use of tree data structures.

This stage enters symbols in the symbol table.

Compilation stage

Lexical analysis

Syntax analysis

Code generation

Optimisation

1 mark for each correct line

[4]

(b) $P Q +$
 $R S / -$

[1]
[1]

(c) (i)

					2			
				3	3	5		
	2		1	1	1	1	6	
2	2	4	4	4	4	4	4	-2
	*				+	+	-	

1 mark per ring

[4]

(ii) $b * a$
 $- (c + d + a)$
Order must be correct for both parts

[1]
[1]

(iii) Rules of precedence means different operators have different priorities // by example multiply is done before add
In RPN evaluation of operators is left to right // operators are used in the sequence in which they are read
No need for brackets // infix may require the use of brackets

[1]
[1]
[1]

[Max 2]

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- 3 (a) The page is present in memory [1]
 Loaded at / stored / present in page frame 542 // its memory address is 542 [1]

- (b) (i) Next instruction is first instruction in Page 6 [1]
 Page 6 is not present in memory [1]
 Instruction can only be executed if present in memory [1]
 Program cannot continue until Page 6 is loaded [1]

[Max 2]

- (ii) When there is an attempt to load an instruction for a page not in memory [1]
 A page fault occurs // Page 5 finishes ... [1]
 this generates an interrupt [1]
 ISR code is executed [1]
 Causes the OS to load page 6 into memory [1]

[Max 3]

- (c) (i) Time of entry (NOT time in memory) [1]

(ii)

Page	Presence Flag	Page frame address	Additional data
6	1	221	12:07:34:49

[1 + 1 + 1]

- (iii) When the procedure call is made – Page 1 is swapped out and Page 3 is swapped in [1]
 At the end of the procedure call – Page 3 is swapped out and Page 1 is swapped in [1]
 Page 1/3 is always in memory shortest amount of time [1]
 The entire sequence is repeated for every iteration [1]

[Max 3]

- (iv) Thrashing // continually swapping pages [1]

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- 4 (a) (i) A set of rules ... [1]
governing communications/transmission of data /sending and receiving data [1]
- (ii) For example, (Web) browser / email client [1]
- (iii) For example, Web server / email server [1]
- (iv) Security //example: for example, alteration of transmitted messages [1]
Privacy // for example, only intended receiver can view data [1]
Authentication // for example, trust in other party [1]

[Max 2]

(b) For example:

- which protocol will be used... [1]
there are a number of different versions of the two protocols [1]
session ID ... [1]
uniquely identifies a related series of messages between server and client [1]
session type ... [1]
reusable or not [1]
encryption method ... [1]
public / private keys to be used // asymmetric/ symmetric [1]
authentication method ... [1]
use of digital certificates / use of digital signature [1]
compression ... [1]
method to be used [1]

[Max 2 parameters]

[Max 4]

(c) For example:

- banking [1]
private / secure email [1]
shopping [1]
financial transactions [1]
secure file transfer [1]

[Max 2]

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5 (a) (i)

Input			Working space	Output	
P	Q	R		J	K
0	0	0		0	0
0	0	1		0	1
0	1	0		0	1
0	1	1		1	0
1	0	0		0	1
1	0	1		1	0
1	1	0		1	0
1	1	1		1	1

1 mark each column

If zero marks then
6 or 7 pairs correct – 1 mark

[2]

(ii) Full adder

[1]

(iii) C / Carry

[1]

S / Sum

[1]

represents the carry part of the addition of three bits

[1]

represents the sum part of the addition of three bits

[1]

(b) (i) A.

[1]

 $(A+B).C$

[1]

(ii) Allow follow through from (b)(i)

A. $((A+B).C)$ $= A.(A.C + B.C)$ $= A.A.C + A.B.C$ $= A.C + A.B.C$ $= A.C (1 + B)$ $= A.C.1$ $= A.C$

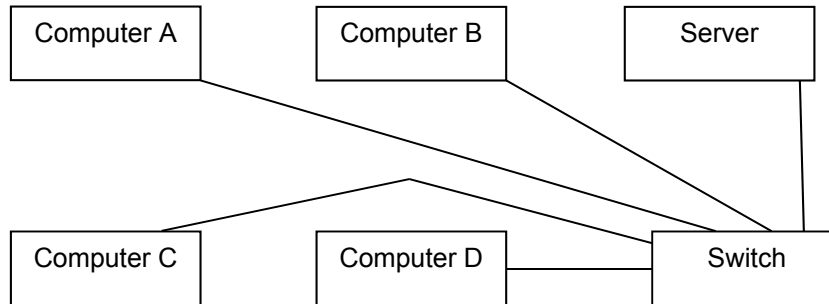
1 mark for each correct simplification line – max 3 [3]

1 mark for A.C if correct answer to part (b)(i) [1]

[4]

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6 (a)



4 ×
Computer to
Switch
[1]

Server to
Switch
[1]

(b)

Statement	True	False
All packets must be routed via the server.		✓
Computer B can read a copy of the packet sent from the Server to Computer A.		✓
No collisions are possible.	✓	

[1]

[1]

[1]

(c) (i) Router / Switch / Bridge

[1]

(ii) Router uses IP addresses in making decisions

[1]

Router has routing table

[1]

Routing table has entry for associated network ID // routing table has entry for host address // routing table used to make decision on where to route packet

[1]

Switch / Bridge use MAC addresses

[1]

MAC address table created

[1]

Switch / bridge use MAC address table to make decision on where to route packet

[1]

[Max 2]