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**COMPUTER SCIENCE**

**9608/31**

Paper 3 Written Paper

**October/November 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

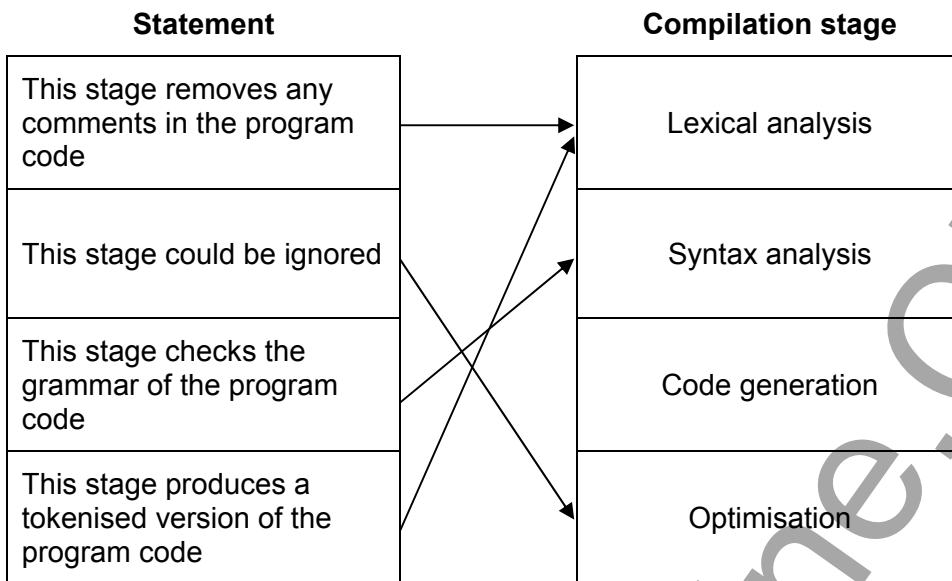
Cambridge will not enter into discussions about these mark schemes.

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| Page 2 | Mark Scheme   | Syllabus | Paper |
|--------|---|----------|-------|
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- 1 (a) +2.5  
= 010100000000 0010 [3]  
Give full marks for correct answer (normalised or not normalised)
- = 10.1 [1]  
=  $0.101 \times 2^2$  // evidence of shifting binary point appropriately [1]
- [Max 3]
- (b) -2.5  
101100000000 0010  
Give full marks for correct answer
- One's complement of 12-bit mantissa of +2.5 101011111111 – allow f.t. [1]  
+1 to get two's complement 101100000000 [1]
- [Max 3]
- (c) 3 [3]  
Give full marks for correct answer
- =  $0.011 \times 2^3$  // exponent is 3 [1]  
=  $11.0 // (1/4 + 1/8) * 8$  [1]
- [Max 3]
- (d) (i) Not normalised [1]
- (ii) First two bits should be different for normalised number  
// because the number starts with 00 [1]
- (e) reduced accuracy [1]  
increased range [1]

2 (a)



1 mark for each correct line

[4]

(b) (i)  $AB + CD - *$

[1]

[1]

(ii)  $A - B / 4 * CD - /$

[1]

[1]

[1]

(c) (i)

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

1 mark per ring

[4]

(ii)  $x * (w + z - y)$   
Order must be correct for both parts

[1]

[1]

(iii) No need for rules of precedence  
No need for brackets  
In RPN evaluation of operators is always left to right

[1]

[1]

[1]

[Max 2]

|        |   |          |       |
|--------|---|----------|-------|
| Page 4 | Mark Scheme   | Syllabus | Paper |
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3 (a) The 245th page frame from the start of memory  
// the 245th page frame from some base address [1]

(b) Flash memory // magnetic disk // hard drive [1]

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

(ii)

| Page | Presence Flag | Page frame address | Additional data |
|------|---------------|--------------------|-----------------|
| 4    | 1             | 542                | 12:07:34:49     |

[1 +1 + 1]

(iii) Number of times the page has been accessed [1]

(iv)

| Page | Presence Flag | Page frame address | Additional data |
|------|---------------|--------------------|-----------------|
| 3    | 1             | 132                | 0               |

[1 +1 + 1]

Accept only zero for 'additional data'

(d) For example:

**Longest resident:** page in for lengthy period of time may be being accessed often [1]  
... so not a good candidate for being removed [1]

**Least used:** a page just entered has a low least used value ... [1]  
so likely to be a candidate for immediately being swapped out [1]

4 (a) (i)

| Input |   | Output |   |
|-------|---|--------|---|
| X     | Y | A      | B |
| 0     | 0 | 0      | 0 |
| 0     | 1 | 0      | 1 |
| 1     | 0 | 0      | 1 |
| 1     | 1 | 1      | 0 |

1 mark for each correct column (A and B)

[2]

(ii) Half adder

[1]

(iii) C // Carry  
S // Sum

[1]

[1]

represents the carry part of the addition of two bits  
represents the sum part of the addition of two bits

[1]

[1]

(b) (i) A.

[1]

$$(A.B + C)$$

[1]

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

$$\begin{aligned} &A.(A.B+C) \\ &= A.A.B + A.C \\ &= A.B + A.C \\ &= A.(B+C) \end{aligned}$$

1 mark for each correct simplification line – max 2  
1 mark for A.(B+C) if correct answer to part (b)(i)

[2]

[1]

5 (a) (i)

|                       |
|-----------------------|
| <b>Application</b>    |
| Transport             |
| <b>Internet</b>       |
| <b>Network / Link</b> |

[1]

[1]

[1]

(ii) software / module / program / code

[1]

- (b) (i) For example:  
 check packet port ... [1]  
     to identify the application type [1]  
 check packet destination socket ... [1]  
     so that packet sent to correct application [1]  
 check incoming packet sequence number ... [1]  
     to ensure data is reassembled in correct order [1]  
 recalculate checksum of packet ... [1]  
     to ensure integrity of packet [1]  
 if packet checksum invalid ... [1]  
     send message to have packet retransmitted [1]

[Max 2 tasks]

[Max 4]

(ii) HTTP / HTTPS

[1]

(iii) POP3

[1]

6 (a)

| Description  | Term     |     |
|--|----------|-----|
| Malware which attaches itself to another program.                                      | VIRUS    | [1] |
| Malware designed to redirect the web browser to a fake website.                        | PHARMING | [1] |
| Email that encourages the receiver to access a website and give their banking details. | PHISHING | [1] |

(b) (i) Plain text is the original text [1]

Cipher text is the encrypted version of the plain text [1]

- (ii) Asymmetric keys means that the key used to encrypt (public key) is different from the key used to decrypt (private key) [1]  
 Ben acquires Mariah's public key [1]  
 Ben encrypts email ... [1]  
 using Mariah's public key [1]  
 Ben sends encrypted email to Mariah [1]  
 Mariah decrypts email ... [1]  
 Using her private key [1]

[Max 4]