



Philadelphia University
Faculty of Engineering

Marking Scheme

Exam Paper

BSc CE

Logic Circuits (630211)

First Exam

Second semester

Date: 24/03/2019

Section 1

Weighting 20% of the module total

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Marking Scheme

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The presented exam questions are organized to overcome course material through 4 questions. The *all questions* are compulsory requested to be answered.

Marking Assignments

Question 1 This question is attributed with 7 marks if answered properly; the answers are as following:

1) Convert the **octal** number 35_8 to **decimal**

- | | |
|-------|-------|
| a) 71 | b) 92 |
| c) 17 | d) 29 |

2) Binary 10111111 is _____ in hexadecimal.

- | | |
|---------------|---------------|
| a) BF_{16} | b) 277_{16} |
| c) 10111111 | d) FB_{16} |

3) The 2's complement of 11100111 is _____.

- | | |
|---------------|---------------|
| a) 11100110 | b) 00011001 |
| c) 00011000 | d) 00011010 |

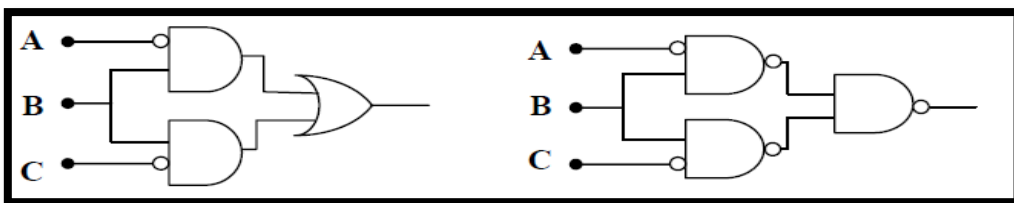
4) The **BCD** number for decimal 347 is

- | | |
|-----------------------|-----------------------|
| a) $1100\ 1011\ 1000$ | b) $1100\ 1011\ 0110$ |
| c) $0011\ 0100\ 0001$ | d) $0011\ 0100\ 0111$ |

5) **Universal** logic gates are:

- | | |
|------------------------|----------------------|
| a) OR and AND | b) NOT and OR |
| c) NAND and NOR | d) OR and XOR |

6) The two circuits below are **equal**.



- | | |
|----------------|-----------------|
| a) True | b) False |
|----------------|-----------------|

7) From the truth table below, determine the standard **SOP** expression.

Inputs			Output
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

- | |
|--|
| a) $X = \bar{A}\bar{B}\bar{C} + ABC + A\bar{B}C$ |
| b) $X = ABC + ABC + ABC$ |
| c) $X = A\bar{B}C + \bar{A}BC + AB\bar{C}$ |
| d) $X = \bar{A}\bar{B}C + \bar{A}BC + AB\bar{C}$ |

Question 2 This question is attributed with 5 marks if answered properly; the answers are as following:

a)

(3.5 marks)

Solution

$AB+A(B+C)+B(B+C)$

- ✓ (distributive law)
 - $\Rightarrow AB+AB+AC+BB+BC$
- ✓ ($BB=B$)
 - $\Rightarrow AB+AB+AC+B+BC$
- ✓ ($AB+AB=AB$)
 - $\Rightarrow AB+AC+B+BC$
- ✓ ($B+BC=B$)
 - $\Rightarrow AB+AC+B$
- ✓ ($AB+B=B$)
 - $\Rightarrow B+AC$

b)

(1.5 marks)

Solution

$(A+B+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+C)$

Question 3 This question is attributed with 4 marks if answered properly; the answers are as following:

$$\begin{aligned}
 F &= (AB)(\overline{CD}) + (B+C+\bar{A}) + (\overline{BDA}) \\
 &= (AB)(C+\bar{D}) + (\bar{B}\bar{C}A) + (\overline{BDA}) \\
 &= (ABC) + (AB\bar{D}) + (\bar{B}\bar{C}A) + (\overline{BDA}) \\
 &= (ABCD) + (ABC\bar{D}) + (ABC\bar{D}) + (ABC\bar{D}) + (A\bar{B}\bar{C}D) + (A\bar{B}\bar{C}\bar{D}) + (\bar{A}\bar{B}CD) + (\bar{A}\bar{B}\bar{C}D) \\
 &\quad 1111 \quad 1110 \quad 1110 \quad 1100 \quad 1001 \quad 1000 \quad 0011 \quad 0001 \\
 &= \sum_{A,B,C,D} (1, 3, 8, 9, 12, 14, 15)
 \end{aligned}$$

Question 4 This question is attributed with 4 marks if answered properly; the answers are as following:

	AB	$\bar{A}\bar{B}$	$\bar{A}B$	$A\bar{B}$
$\bar{C}\bar{D}$	m0 1	m4 1	m12 0	m8 0
$\bar{C}D$	m1 0	m5 0	m13 0	m9 0
CD	m3 1	m7 1	m15 1	m11 0
$C\bar{D}$	m2 1	m6 1	m14 1	m10 1

$f = \bar{C}\bar{D} + BC + \bar{A}C + \bar{A}\bar{D}$