Philadephia University  
Faculty of Engineering

Marking Scheme

Exam Paper
BSc CE

Logic Circuits (630211)

First Exam  First semester  Date: 21/11/2019

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 6 marks if answered properly; the answers are as following:

1) The **binary** number for \( \text{F7A}_{16} \) is
   
   a) 1110111110101001  
   b) 1111111010110001  
   c) **1110111101010001**  
   d) 1111011010101001

2) When signed numbers are used in binary arithmetic, then which one of the following notations would have **unique** representation for zero?
   
   a) Sign-magnitude  
   b) 9’s complement  
   c) 1’s complement  
   d) **2’s complement**

3) The **signed magnitude** number \( \text{11001100}_{2} \) is equivalent to
   
   a) \( -76_{10} \)  
   b) \( 204_{10} \)  
   c) \( \text{CC}_{16} \)  
   d) \( 1212_{10} \)

4) The **octal** equivalent of the number \( \text{700}_{16} \) is:
   
   a) 1000  
   b) **3400**  
   c) 700  
   d) 7000

5) The **octal** number represented by the **binary** number \( \text{110111011.101}_{2} \) is
   
   a) **673.5**  
   b) 3131.21  
   c) **none of the above**

6) In the sum of products functions \( f(X, Y, Z) = \sum(2, 3, 4, 5) \), the **prime implicants** are
   
   a) \( \bar{X}Y, XY \)  
   b) \( \bar{X}Y, XYZ, XYZ \)  
   c) \( \bar{X}YZ, XYZ, XY \)  
   d) \( \bar{X}YZ, XYZ, XYZ, XYZ \)

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

a) **(2 marks)**

   ![Solution](image1)

b) **(3 marks)**

   ![Solution](image2)
Question 3 This question is attributed with 5 marks if answered properly; the answers are as following:

\[ D = (\overline{A} + B)(C + \overline{C})(\overline{B} + C)(A + \overline{A}) \]
\[ = (A + B + C)(\overline{A} + B + C)(\overline{A} + B + \overline{C})(\overline{A} + B + C) \]
\[ = M_2 \cdot M_4 \cdot M_5 \cdot M_6 = \Pi(2, 4, 5, 6) \]

**Product of Maxterms**

\[ D = \Sigma(0, 1, 3, 7) = m_0 + m_1 + m_3 + m_7 = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}BC + ABC \]

b) 

**Solution**

\[
\begin{array}{cccc|c}
 w & x & y & z & \text{Output} = wx + xz + y \\
\hline
 0 & 0 & 0 & 0 & 1 \\
 0 & 0 & 0 & 1 & 1 \\
 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 1 & 1 & 0 \\
 0 & 1 & 0 & 0 & 1 \\
 0 & 1 & 0 & 1 & 1 \\
 0 & 1 & 1 & 0 & 0 \\
 0 & 1 & 1 & 1 & 1 \\
 1 & 0 & 0 & 0 & 1 \\
 1 & 0 & 0 & 1 & 1 \\
 1 & 0 & 1 & 0 & 0 \\
 1 & 0 & 1 & 1 & 0 \\
 1 & 1 & 0 & 0 & 1 \\
 1 & 1 & 0 & 1 & 1 \\
 1 & 1 & 1 & 0 & 1 \\
 1 & 1 & 1 & 1 & 1 \\
\end{array}
\]

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

**Solution**

\[ E = \overline{A} + C \]