Marking Scheme

Exam Paper
BSc CE

Logic Circuits (630211)

First Exam First semester Date: 18/11/2018

Section 1
Weighting 20% of the module total

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Marking Scheme

Logic Circuits (630211)

The presented exam questions are organized to overcome course material through 6 questions. The all questions are compulsory requested to be answered.

Marking Assignments

**Question 1** This question is attributed with 8 marks if answered properly; the answers are as following:

1) Convert the hexadecimal number $14B_{16}$ to binary.
   - a) $110110100001_2$
   - b) $000101001101_2$
   - c) $000101001111_2$
   - d) $101101000001_2$

2) $(734)_{10} = ( )_{16}$
   - a) $1DC$
   - b) $C1D$
   - c) $DC1$
   - d) $1CD$

3) Convert $59.72_{10}$ to BCD.
   - a) $110111$
   - b) $0101100101110010$
   - c) $1110.11$
   - d) $01011001.01110010$

4) The range of decimal numbers that can be written in 6 bit sign magnitude form:
   - a) -31 to 31
   - b) 0 to 64
   - c) -32 to 31
   - d) -64 to 64

5) The circuit given below implements the equation, $X = \overline{A}B + \overline{A}C + ABC$.
   - a) True
   - b) False

6) The logic circuit shown can be minimized to
   - a) A
   - b) B
   - c) C
   - d) D

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

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>0</td>
</tr>
<tr>
<td>01</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>

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

8) The K-map in the figure below shows the correct implementation of the expression $X = ACD + AB (CD + BC)$.
   - a) True
   - b) False
**Question 2** This question is attributed with 2 marks if answered properly; the answers are as following:

**Solution**

![Logic Diagram]

**Question 3** This question is attributed with 2 marks if answered properly; the answers are as following:

**Solution**

\[
Q = B.C.\overline{C} + D + C + \overline{A} \\
Q = B.C.\overline{B} + B.C.D + C.D + C + \overline{A} \\
Q = B.\overline{B} + B.C.D + C.(D + 1) + \overline{A} \\
Q = B.C.D + C + \overline{A} \\
Q = C.(B.D + 1) + \overline{A} \\
Q = C.1 + \overline{A} \\
Q = C + \overline{A}
\]

**Question 4** This question is attributed with 2 marks if answered properly; the answers are as following:

**Solution**

**SOP expression:**

\[
\overline{A} \overline{B} \overline{C} + \overline{A}B\overline{C} + A\overline{B}C + ABC
\]

**POS expression:**

\[
(A + B + \overline{C})(A + \overline{B} + \overline{C})(\overline{A} + B + C)(\overline{A} + \overline{B} + \overline{C})
\]

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

**Solution**

\[
x + yz = x(1) + (1)yz = x(y + y') + (x + x')yz = xy + xy' + xyz + x'y'z
= xy(1) + xy'(1) + xyz + x'y'z = xy(z + z') + xy'(z + z') + xyz + x'y'z
= xyz + xyz' + xy'z + x'y'z + xyz + x'y'z
= xyz + xyz' + xy'z + x'y'z + x'y'z \quad \cdots - (x + x = x)
= 111 + 110 + 101 + 100 + 011
= m7 + m6 + m5 + m4 + m3
\]

\[
x + yz = \sum m(3, 4, 5, 6, 7)
\]

**Question 6** This question is attributed with 4 marks if answered properly; the answers are as following:

**Solution**

![Truth Table]

\[
F(A, B, C, D) = \overline{A}BC + A\overline{B}C
\]