Logic Circuits (630211)

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**.
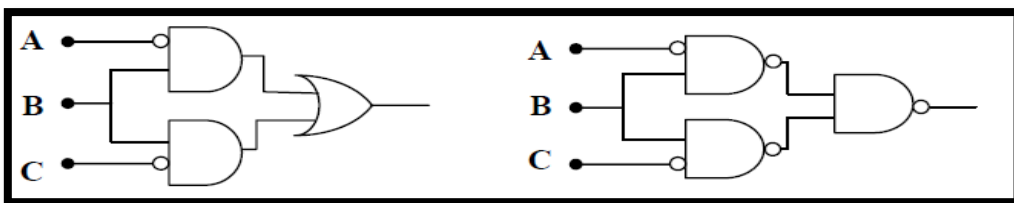
a)	**True**		**b)**	False

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)	$X = \bar{A}\,\bar{B}\,\bar{C} + A\,B\,C + A\,\bar{B}\,C$
b)	$X = A\,B\,C + A\,B\,C + A\,B\,C$
c)	$X = A\,\bar{B}\,C + \bar{A}\,B\,C + A\,B\,\bar{C}$
d)	$X = \bar{A}\,\bar{B}\,C + \bar{A}\,B\,C + A\,B\,\bar{C}$

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

a) *(3.5 marks)*

AB+A(B+C)+B(B+C)
- ✓ **(distributive law)**
  - ⇨ **AB+AB+AC+BB+BC**
- ✓ **(BB=B)**
  - ⇨ **AB+AB+AC+B+BC**
- ✓ **(AB+AB=AB)**
  - ⇨ **AB+AC+B+BC**
- ✓ **(B+BC=B)**
  - ⇨ **AB+AC+B**
- ✓ **(AB+B=B)**
  - ⇨ **B+AC**

b) *(1.5 marks)*

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

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

$$F = (AB)(\overline{\overline{C}D}) + \overline{(B+C+\overline{A})} + (\overline{B}D\overline{A})$$

$$= (AB)(C+\overline{D}) + (\overline{B}\,\overline{C}A) + (\overline{B}D\overline{A})$$

$$= (ABC) + (AB\overline{D}) + (\overline{B}\,\overline{C}A) + (\overline{B}D\overline{A})$$

$$= (ABCD) + (ABC\overline{D}) + (ABC\overline{D}) + (AB\overline{C}\,\overline{D}) + (A\overline{B}\,\overline{C}D) + (A\overline{B}\,\overline{C}\,\overline{D}) + (\overline{A}\,\overline{B}CD) + (\overline{A}\,\overline{B}\,\overline{C}D)$$

$$\quad 1\ 1\ 1\ 1 \qquad 1\ 1\ 1\ 0 \qquad 1\ 1\ 1\ 0 \qquad 1\ 1\ 0\ 0 \qquad 1\ 0\ 0\ 1 \qquad 1\ 0\ 0\ 0 \qquad 0\ 0\ 1\ 1 \qquad 0\ 0\ 0\ 1$$

$$= \sum_{A,B,C,D}(1, 3, 8, 9, 12, 14, 15)$$

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

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