الامتحانات الرسمية لشهادة البكالوريا الفنية
لدورة عام 2018 الثانية

الاسم والشهرة:-----------------
رقم المرشح :-----------------

الاختصاص والرمز : تكنولوجيا المعلوماتية (84007)
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المعدل : (12)
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## Treat the following exercises:

**I. Fill in the following truth table:** **(3 pts)**

| A | B | A | B | A.B | $\overline{A+B}$ | A.B | $A.B.(\overline{A+B})+\bar{A}.\bar{B}$ |
|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | |
| 0 | 1 | | | | | | |
| 1 | 0 | | | | | | |
| 1 | 1 | | | | | | |

**II. Using exclusively the Boolean algebra, demonstrate that :** **(3 pts)**

a) $(A+B)(A+\bar{B}) = A$

b) $AB + BC + \bar{A}C = AB + \bar{A}C$

c) $\overline{A\bar{B} + \bar{A}B} = AB + \bar{A}\bar{B}$

**III. Give the simplified functions of the following tables using the Karnaugh map :** **(3 pts)**

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $AB$ | 0 | 0 | 1 | 0 |
| $AB$ | 1 | 1 | 1 | 1 |
| $AB$ | 1 | 1 | 1 | 1 |
| $AB$ | 0 | 1 | 0 | 0 |

Table 1

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $AB$ | 0 | 1 | 1 | 0 |
| $AB$ | 1 | 1 | 1 | 1 |
| $AB$ | 0 | 1 | 1 | 0 |
| $AB$ | 0 | 1 | 1 | 0 |

Table2

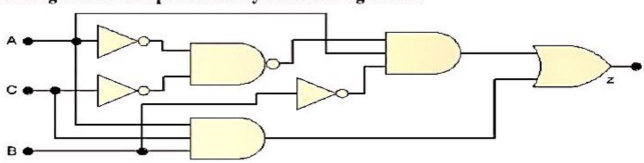
| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $AB$ | 0 | 0 | 0 | 0 |
| $AB$ | 1 | 1 | 1 | 1 |
| $AB$ | 0 | 0 | 0 | 0 |
| $AB$ | 1 | 1 | 1 | 1 |

Table 3

**IV. Realize a logic circuit with 3 inputs (A, B, C) and 2 outputs ($F_0$, $F_1$) and which gives the number of 1s applied at the inputs:** **(4 pts)**

a) Build the corresponding truth table.
b) Find the logical expression of the output $F_0$.
c) Find the logical expression of the output $F_1$.
d) Simplify the expression of $F_0$.
e) Draw the simplified circuit of $F_0$ with **NAND** gates two-input only.

**V. What is the logical function performed by the following circuit?** **(2½ pts)**




**VI. Fill in the table below for a multiplexer of 4-inputs ($I_3$, $I_2$, $I_1$, $I_0$), two selections inputs ($S_1$, $S_0$) and one output:** **(2 pts)**

| $I_3$ | $I_2$ | $I_1$ | $I_0$ | | $S_1$ | $S_0$ | Output |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | | 1 | 0 | |
| 0 | 1 | 0 | 0 | | 0 | 1 | |
| 1 | 1 | 0 | 1 | | 1 | 1 | |
| 1 | 1 | 1 | 0 | | 0 | 0 | |

**VII. Complete the following table:** **(2 ½ pts)**

| X | Y | Z | CK | $Q_A$ | $Q_B$ | F |
|---|---|---|---|---|---|---|
| 1 | 0 | 1 | | | | |
| 0 | 1 | 0 | | | | |
| 1 | 1 | 1 | | | | |
| 0 | 0 | 1 | | | | |
| 1 | 1 | 1 | | | | |
| 0 | 0 | 0 | | | | |
| 0 | 1 | 1 | | | | |
| 1 | 1 | 1 | | | | |

Knowing that:

a. X and Y are respectively the values of J and K of a JK flip-flop named A.
b. Y and Z are respectively the values of J and K of a JK flip-flop named B.
c. $F = Q_A \oplus Q_B$.

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I-

| $A$ | $B$ | $\bar A$ | $\bar B$ | $A.B$ | $\overline{A+B}$ | $\bar A.\bar B$ | $A.B+(\overline{A+B})+\bar A.\bar B$ |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |

II a) $(A+B)(A+\bar B) = A$

$AA + A\bar B + AB + B\bar B = A$

$A + A\bar B + AB = A$

$A(1+\bar B+B) = A$

$A = A$

b) $AB + \underbrace{BC}_{\text{consensus term}} + \bar A C = AB + \bar A C$

$AB + (A+\bar A)(BC) + \bar A C = AB + \bar A C$

$AB + ABC + \bar A BC + \bar A C = AB + \bar A C$

$AB(1+C) + \bar A C(B+1) = AB + \bar A C$

$AB + \bar A C = AB + \bar A C$

c) $\overline{A\bar B + \bar A B} = AB + \bar A B$

$(\bar A + B)(A+\bar B) = AB + \bar A B$

$\bar A A + \bar A\bar B + AB = B\bar B = AB + \bar A\bar B$

$\bar A\bar B + AB = AB + \bar A\bar B$

III-

| | $\bar C\bar D$ | $\bar C D$ | $CD$ | $C\bar D$ |
|---|---|---|---|---|
| $\bar A\bar B$ | 0 | 0 | 1 | 0 |
| $\bar A B$ | 1 | 1 | 1 | 1 |
| $AB$ | 1 | 1 | 1 | 1 |
| $A\bar B$ | 0 | 1 | 0 | 0 |

Table 1

$B + A\bar C D + \bar A C D$

| | $\bar C\bar D$ | $\bar C D$ | $CD$ | $C\bar D$ |
|---|---|---|---|---|
| $\bar A\bar B$ | 0 | 1 | 1 | 0 |
| $\bar A B$ | 1 | 1 | 1 | 1 |
| $AB$ | 0 | 1 | 1 | 0 |
| $A\bar B$ | 0 | 1 | 1 | 0 |

Table 2

$D + \bar A B$

| | $\bar C\bar D$ | $\bar C D$ | $CD$ | $C\bar D$ |
|---|---|---|---|---|
| $\bar A\bar B$ | 0 | 0 | 0 | 0 |
| $\bar A B$ | 1 | 1 | 1 | 1 |
| $AB$ | 0 | 0 | 0 | 0 |
| $A\bar B$ | 1 | 1 | 1 | 1 |

Table 3

$\bar A B + A\bar B$

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IV- a)

| A | B | C | $f_0$ | $f_1$ |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 |

b) $f_0 = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$

c) $f_1 = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$

d) $f_0 = \bar{A}BC + A\bar{B}C + AB\bar{C} + A\cancel{B}C$

$= BC(\bar{A}+A) + A\bar{B}C + AB\bar{C}$

$= BC + A\bar{B}C + AB\bar{C}$

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

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

$= BC + AC + AB\bar{C}$

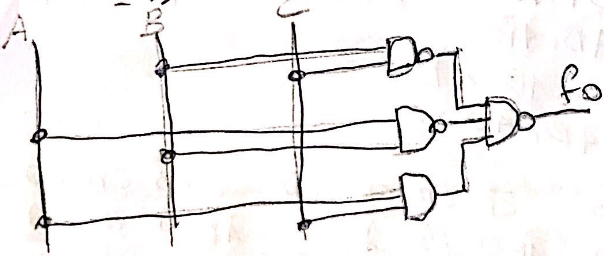
$= B(C + A\bar{C}) + AC$

$= B(C+A) + AC$

$= BC + AB + AC$

e) $f_0 = BC + AB + AC$

$= \overline{\overline{BC} \cdot \overline{AB} \cdot \overline{AC}}$




V. $Z = (\overline{A\bar{C}} \cdot A \cdot B) + AB$

VI.

| $I_3$ | $I_2$ | $I_1$ | $I_0$ | $S_1$ | $S_0$ | output |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 0 | $I_2$ |
| 0 | 1 | 0 | 0 | 0 | 1 | $I_1$ |
| 1 | 1 | 0 | 1 | 1 | 1 | $I_3$ |
| 1 | 1 | 1 | 0 | 0 | 0 | $I_0$ |

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VII -

| X | Y | Z | C.K | $Q_A$ | $Q_B$ | F |
|---|---|---|---|---|---|---|
| 1 | 0 | 1 | | 1 | 0 | 1 |
| 0 | 1 | 0 | | 0 | 1 | 1 |
| 1 | 1 | 1 | | 1 | 0 | 1 |
| 0 | 0 | 1 | | 1 | 0 | 1 |
| 1 | 1 | 1 | | 0 | 1 | 1 |
| 0 | 0 | 0 | | 0 | 1 | 1 |
| 0 | 1 | 1 | | 0 | 0 | 0 |
| 1 | 1 | 1 | | 1 | 1 | 0 |

$F = A \oplus B = A\bar{B} + \bar{A}B$

0 متشابهين

1 مختلفين