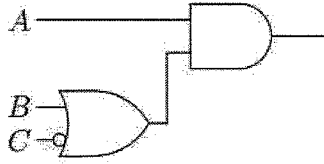1. [1 mark]   Write   using Boolean symbols:

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

2. [4 marks] a) Build the truth table for $(\sim p \wedge \sim q) \vee (p \wedge q)$.

p	q	$\sim p$	$\sim q$	$\sim p \wedge \sim q$	$p \wedge q$	$(\sim p \wedge \sim q) \vee (p \wedge q)$
0	0	1	1	1	0	1
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	1	0	0	0	1	1

b) Is $(\sim p \wedge \sim q) \vee (p \wedge q)$ logically equivalent to $p \wedge q$? State YES or NO.

NO.
The columns are not identical.

3. [4 marks] The following statement is true:
If Raj lives in the city of Gal then Raj lives in the state of Oanu.
Answer YES, NO or MAYBE.

a) Raj lives in the state of Oanu. Does he live in the city of Gal?

MAYBE

b) Raj does not live in the state of Oanu. Does he live in the city of Gal?

No

c) Raj lives in the city of Gal. Does he not live in the state of Oanu?

No

d) Raj does not live in the city of Gal. Does he live in the state of Oanu?

MAYBE

4. [4 marks] The following statement is true:
Swizzles sob if and only if lants laugh.
Answer YES, NO or MAYBE.

a) Lants laugh. Do swizzles sob?

YES

b) Swizzles don't sob. Do lants laugh?

No

c) Lants don't laugh. Do swizzles sob?

No

d) Swizzles sob. Do lants not laugh?

No

5. [4 marks] a) Build a truth table that contains the following columns:
$p \to q, q \to p, p \leftrightarrow q$, $p \oplus q$, $\sim(p \oplus q)$

p	q	$p \to q$	$q \to p$	$p \leftrightarrow q$	$p \oplus q$	$\sim(p \oplus q)$
0	0	1	1	1	0	1
0	1	1	0	0	1	0
1	0	0	1	0	1	0
1	1	1	1	1	0	1

b) Is $\sim(p \oplus q)$ logically equivalent to $p \leftrightarrow q$? State YES or NO.

YES. The columns are identical.

6. [4 marks] State the name of the law that is being used:

a) $\overline{\overline{C}\overline{D}} = \overline{\overline{C}} + \overline{D}$

   De Morgan's

b) $AB(\overline{AB} + C) = ABC$

   Absorption

c) $(\sim q \vee r) \wedge (\sim q \vee r) \Leftrightarrow (\sim q \vee r)$

   Idempotent

d) $r \wedge (\sim p \vee q) \Leftrightarrow (r \wedge \sim p) \vee (r \wedge q)$

   Distributive

7. [4 marks] Use the Laws of Logic to simplify the following. Use one law per line, and state the name of the law on each line.

$$\overline{ABC} + \overline{C} \cdot 1$$

$$= \overline{\overline{AB}} + \overline{C} + \overline{C} \cdot 1 \qquad \text{De Morgan's}$$

$$= AB + \overline{C} + \overline{C} \cdot 1 \qquad \text{Complement}$$

$$= AB + \overline{C} + \overline{C} \qquad \text{Identity}$$

$$= AB + \overline{C} \qquad \text{Idempotent}$$