

(A) generated problems on truth-tables)

1.1

A and (not B)

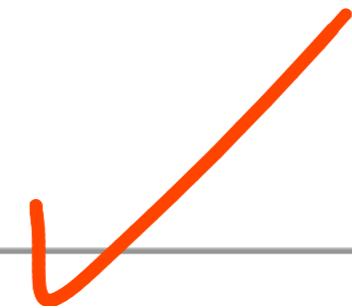
A	B	not B	A and (not B)
true	true	false	false
true	false	true	true
false	true	false	false
false	false	true	false

1.2

$$(A \text{ or } B) \text{ and } (\text{not } A)$$

A	B	$A \text{ or } B$	$\text{not } A$	$(A \text{ or } B) \text{ and } (\text{not } A)$
true	true	true	false	false
true	false	true	false	false
false	true	true	true	true
false	false	false	true	false

~



1.3

not (A and B)

A	B	A and B	not(A and B)
true	true	true	false
true	false	false	true
false	true	false	true
false	false	false	true

② Show that the below two expressions are logically equivalent by constructing their truth tables:

2.1  $\neg(A \text{ or } B)$

A	B	$A \text{ or } B$	$\neg(A \text{ or } B)$
true	true	true	false
true	false	true	false
false	true	true	false
false	false	false	true

2.2  $(\neg A) \text{ and } (\neg B)$

A	B	$\neg A$	$\neg B$	$(\neg A) \text{ and } (\neg B)$
true	true	false	false	false
true	false	false	true	false
false	true	true	false	false
false	false	true	true	true

same

Both expression have the same values for all combinations of  $A \text{ and } B$ . So they are equal.

$(A \Rightarrow B)$

③ In logic,  $A$  implies  $B$  is often represented as  $(\text{not } A) \text{ or } B$ .

Construct a truth table for  $(\text{not } A) \text{ or } B$  and analyze the results.

When is this expression False?

$A \Rightarrow B$

A	B	$\text{not } A$	$(\text{not } A) \text{ or } B$
true	true	false	true
true	false	false	false
false	true	true	true
false	false	true	true

A true statement can't imply a false statement, but it can imply a true statement. A false statement can imply true or false statements.

Answer: When  $A$  is true,  $B$  is false, only then, the expression  $(\text{not } A) \text{ or } B$  is false.

④ Given a truth table, find a logical expression using "and, or & not" that produces this output.

A	B	Output	$P_J$	$Q_J$
True	True	False ①	$(A \text{ and } \neg B) \text{ or } (\neg A \text{ and } B)$	
True	False	True ②	J	J
False	True	True ③	②	③
False	False	False ④	P is true only for case ② Q is true only for case ③ P or Q is true for cases ② & ③ but not ① & ④	

I need some help with this answer.

You can write the truth tables for  $P_J Q_J$ ,  $P \otimes Q$  to verify.

⑤ A simple circuit has two inputs A and B, and one output.

The output is True only when A is True and B is False.

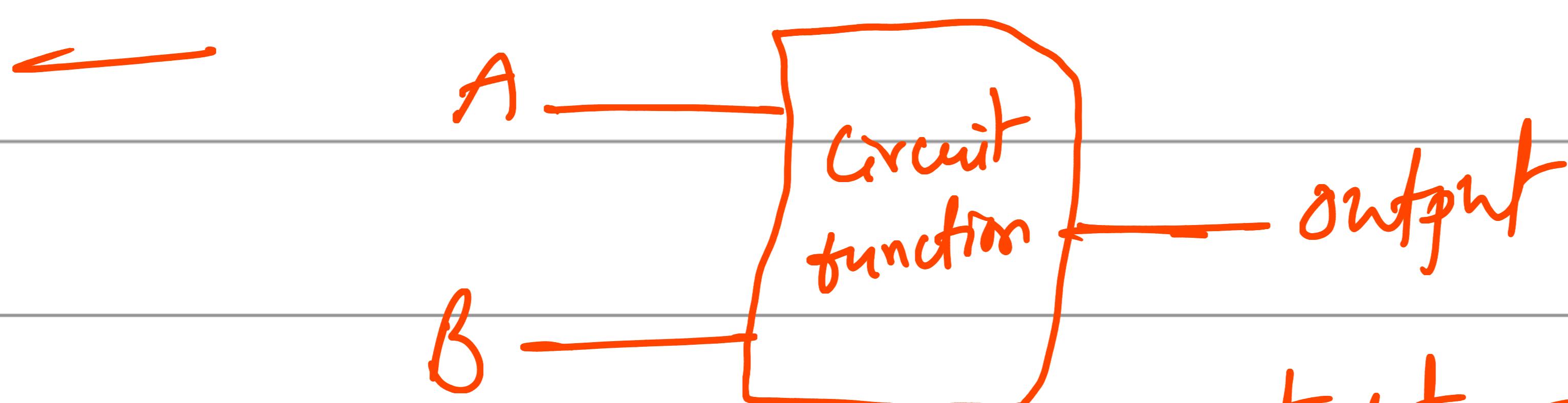
5.1 Draw a simple diagram of this circuit using 'and', 'OR', and 'NOT' gates.

5.2 Construct a truth table to represent the circuit's behavior.

I need some help with this answer.

A circuit is a connection between switches (boolean values), wires, and logic gates (AND, OR, NOT)

Circuit:



$$\text{output} = A \text{ and } \neg B$$

Truth table:

$A$	$\overline{B}$	$\sim B$	$A$	and $\sim B$
T	T	F		F
T	F	T		T
F	T	F		F
P	F	T		F