1. (12p) Write the logic expression of a 1-bit comparator, draw the circuit, and complete the time diagram.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| input | | output | | |
| A | B |  |  |  |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |













1. (12p) Use Karnaugh map to reduce the expression.



 

 





1. (18p) Give the truth table of a 1-bit full adder, and implement if using 1-of-8 multiplexer.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| input | | | output | |
| Cin | A | B | Cout | S |
| 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 |



1. Consider the following three-variable function:



* (10p) Give its canonical SOP and canonical POS.

canonical SOP:









canonical POS:





* (12p) Implement the function using nand gates.









* (18p) Implement the function using 3-line-to-8-line decoder.

或者

* (18p) Implement the function using 1-of-4 multiplexer(use a, b as select inputs).



或者

