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מעבדה לVHDL – יישום זיכרון

הרצנו על הערכה שני תוכניות.

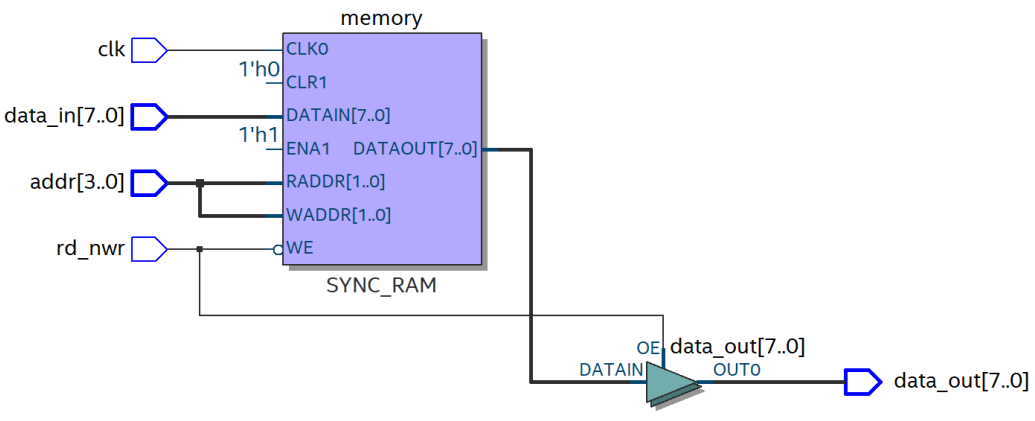
תוכנית 1:

```
library ieee;
use ieee.std_logic_1164.all;
use ieee.std_logic_unsigned.all;

entity ram is
generic (bits:integer:=8;
            bitswords: integer := 4);
port (clk, rd_nwr : in std_logic;
        addr: in std_Logic_vector (bitswords-1 downto 0);
        data_in: in  std_logic_vector (bits-1 downto 0);
              data_out:out std_logic_vector (bits-1 downto 0));
end ram;

architecture rama of ram is
type vector_array is Array (0 to bitswords-1) of
             std_logic_vector (bits-1 downto 0);
signal memory: vector_array;
begin
process (clk,rd_nwr)
begin
if rd_nwr = '1' then data_out <= memory (CONV_INTEGER(addr)); -- read state
    else  data_out <= (others => 'Z'); -- write state
      if clk'event and clk = '1' then
              memory (CONV_INTEGER(addr)) <= data_in;
           end if;
end if;
end process;
end;
```

סכימת RTL:

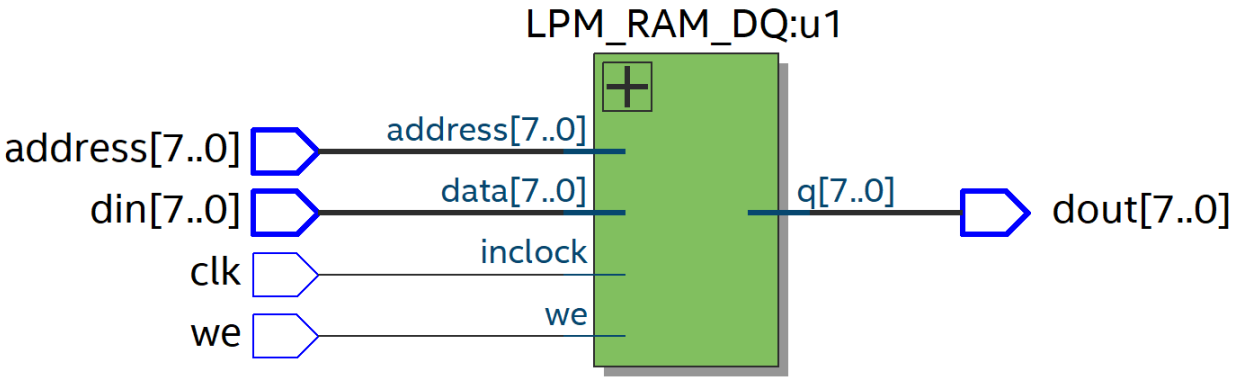


תוכנית 2:

```
library ieee;
use ieee.std_logic_1164.all;
library lpm;
use lpm.lpm_components.all;
entity ramex is port(
      address : in std_logic_vector (7 downto 0);
      we, clk : in std_logic;
      din : in std_logic_vector (7 downto 0);
      dout : out std_logic_vector (7 downto 0));
end;

architecture arc of ramex is
begin
-- lpm_ram_dq : separate input/output data ;  lpm_ram_io : common
input/output data
-- REGISTERED/UNREGISTERED : DATA+CONTROL INPUTS -
 --SYNCHRONIZED (default)/NOT SYNCH to  inclock
-- MEMORY FILES : hex, mif - memory initialization file
u1: lpm_ram_dq
     generic map (lpm_width => 8,
                  lpm_widthad => 8,
                         lpm_outdata => "UNREGISTERED",
                         lpm_file => "Memory.mif")
            port map (data => din,
                      address => address,
                      we => we,
                      inclock => clk,
                      q => dout);
end;
```

סכימת RTL:



לצורך בדיקת הרכיב LPM פתחנו קובץ לכתיבת ערכים התחלתיים לזיכרון RAM ובו הכנסנו את הערכים הבאים:

Addı	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
000	FF	00	01	84	A3	C9	8B	0F	.....
008	D3	FD	8A	9C	AC	CA	36	57	.....6W
010	00	00	00	00	00	00	00	00	.....
018	00	00	00	00	00	00	00	00	.....

ואכן ראינו לאחר הרצה שערכים אלה נרשמו בזיכרון.