

Nov - Dec 2022

B.Tech Program: **Electronics and Telecommunication**

Examination: **TY** Semester: **V**

Course Code: **EXC502**

Duration: **2.5 Hours**

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Course Name: **Digital VLSI Design**

Max. Marks: **60**

	Max. Marks	CO	BT level
<b>Q1 Solve any six questions out of eight:</b>	<b>12</b>		
i) Draw MOS structure of nMOS.	2	1	R
ii) Define fall time ( $T_f$ ) for CMOS inverter.	2	2	R
iii) Draw NOR gate using C <sup>2</sup> MOS.	2	3	U
iv) Differentiate between NAND ROM and NOR ROM.	2	4	U
v) Draw block diagram for 4 bit Ripple Carry Adder.	2	5	U
vi) How FSM is different from HLMS?	2	6	R
vii) Draw OR gate using Transmission Gate.	2	3	U
viii) What is photolithography?	2	1	R
<b>Q.2 Solve any four questions out of six.</b>	<b>16</b>		
i) Draw and explain output characteristics of nMOS with respect to MOSFET operation.	4	1	U
ii) Derive an expression for input high voltage ( $V_{IH}$ ) of CMOS inverter.	4	2	U
iii) Realize the logical expression $y = \overline{A+BC}$ using static CMOS and draw stick diagram for the same.	4	3	A
iv) Draw a 6T-SRAM cell. Explain Read '0' and write '1' operation for the same.	4	4	U
v) Demonstrate addition of $(1101\ 0000\ 1101\ 1011)_2$ and $(0010\ 1111\ 0010\ 1010)_2$ using Carry Look Ahead Adder.	4	5	A
vi) Draw HLMS for Laser Based Distance Measurer using RTL design.	4	6	A

**Q.3 Solve any two questions out of three.**

16

- i) Write a short note on scaling. Explain type of scaling? What is the effect on the following parameters due to different types of scaling:  $V_{DD}$ ,  $I_{D(lin)}$ ,  $I_{D(sat)}$ ,  $C_{OX}$ ,  $P_{DC}$ ,  $V_T$ ,  $L$ ,  $W$ . 8 1 U
- ii) Consider a CMOS inverter with the following parameters: 8 2 A  
nMOS :  $V_{t,n} = 0.6$  V  $\mu_n C_{ox} = 100$   $\mu A/V^2$   $(W/L)_n = 8$   
pMOS :  $V_{t,p} = -0.7$  V  $\mu_p C_{ox} = 50$   $\mu A/V^2$   $(W/L)_p = 12$   
Calculate the noise margin high. The power supply voltage is  $V_{DD} = 3.3$  V.
- iii) Design a NOR based ROM for given data. 1001, 1011, 0001, 1000. Draw stick diagram for the same. 8 4 A

**Q.4 Solve any two questions out of three.**

16

- i) Draw D flip flop using transmission gate. Explain its working in brief. 8 3 A
- ii) Draw 16 bit Carry Skip Adder. Explain its operation. How it speeds up the addition? 8 5 An
- iii) Design Soda Dispenser Machine using RTL design. Design it till FSM stage. 8 6 C

\*\*\*\*\*