Total No. of Questions: 22

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

EC3CO20 VLSI Design

Programme	:	B.Tech.	**Branch/Specialisation**	:	EC
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Q1. In nmos transistor condition for linear operation is- **Marks: 1 CO: 1 BL: 1**

Rubric	Marks
Vds ≤ Vgs –Vtp	1

- ○ Vgs > Vtp
- ○ Vds ≥ Vgs –Vtp
- ◉ Vds ≤ Vgs –Vtp
- ○ Vgs=0

Q2. What is the correct expression for noise margin of any logic gate? **Marks: 1 CO: 1 BL: 1**

Rubric	Marks
VIL -VOL	1

- ○ VOH -VOL
- ○ VIH -VIL
- ○ VIH -VOL
- ◉ VIL -VOL

Q3. In static CMOS logic circuit the p-MOS transistor acts as- **Marks: 1 CO: 2 BL: 1**

Rubric	Marks
Pull up network	1

- ○ Pull down network
- ◉ Pull up network
- ○ Short to ground
- ○ Amplifier

Q4. For Vtn= | Vtp | in CMOS inverter, we will get symmetric VTC if- **Marks: 1 CO: 2 BL: 1**

Rubric	Marks
KR=1	1

- ◉ KR=1
- ○ KR >1
- ○ KR <1
- ○ KR=0

Q5. The race in which stable state does not depend on order of change of variables is called- **Marks: 1 CO: 3 BL: 1**

Rubric	Marks
Non critical race	1

- ○ Critical race
- ○ Identical race
- ◉ Non critical race
- ○ Undefine race

Q6. Choose the correct statement: 1 3 1

Rubric	Marks
Mealy and Moore machine depends on current State	1

- ○ Mealy and Moore machine does not depend on input
- ○ Mealy and Moore machine depend on input
- ◉ Mealy and Moore machine depends on current State
- ○ Mealy and Moore machine depend on both input and current state

Q7. In mealy machine, the O/P depends upon? 1 3 1

Rubric	Marks
State and Input	1

- ○ Next State only
- ○ Previous State only
- ◉ State and Input
- ○ Input only

Q8. Finite state machines are used for- 1 4 1

Rubric	Marks
algorithmic test patterns	1

- ○ Deterministic test patterns
- ◉ Algorithmic test patterns
- ○ Random test patterns
- ○ Pseudo random test patterns

Q9. Photoresist is formed by- 1 4 1

Rubric	Marks
light sensitive polymer	1

- ○ High Sensitive polymer
- ◉ Light sensitive polymer
- ○ Polysilicon
- ○ Silicon dioxide

Q10. Which one of the following is a fabrication process? 1 4 1

Rubric	Marks
Diffusion	1

- ○ EGS
- ○ MGS
- ◉ Diffusion
- ○ Float zone

Section 2 (Answer all question(s))

Marks CO BL

Q11. Implement following circuits by pass transistor logic- 2 1 3

- y= A'B+AB'
- Y= A+ BC

Rubric	Marks
Part a,Part b	2

Q12. What do you mean by strong and weak logic? In this context explain the working of nmos and pmos pass transistors. 3 1 2

Rubric	Marks
strong and weak logic,working of nmos and pmos pass transistors.	3

Q13. (a) Explain the working of enhancement type n-channel MOSFET with proper diagrams. **5 1 1**

Rubric	Marks
working of enhancement type n-channel MOSFET ,diagrams.	5

(OR)

(b) How transmission gate is constructed? Explain its workings. Implement a 4*1 mux by using transmission gate logic.

Rubric	Marks
ransmission gate,Implement a 4*1 mux by using transmission gate logic.	5

Section 3 (Answer all question(s))

Marks CO BL

Q14. Regarding digital inverter define the following with proper diagrams: **4 2 1**

- Noise margin
- Propagation delay
- Rise time & fall time
- Power dissipation

Rubric	Marks
Noise margin,propagation delay,Rise time and fall time and Power Dissipation	4

Q15. (a) Draw schematic and VTC for CMOS inverter. **6 2 2**

Rubric	Marks
schematic,VTC	6

(OR)

(b) Implement full adder using static CMOS logic.

Rubric	Marks
Implement full adder using static CMOS logic	6

Section 4 (Answer all question(s))

Marks CO BL

Q16. Define with example state diagram and state table. **2 3 1**

Rubric	Marks
state diagram and state table.	2

Q17. (a) Minimize the following using merger graph: **8 3 1**

Table 1

Present state	Next State, z	
	x = 0	
A	F, 1	C, 0
B	E, 0	B, 1
C	D, 0	C, 0
D	F, 1	C, 1
E	G, 0	B, 0
F	A, 1	F, 1
G	E, 1	G, 0

Rubric	Marks
step marking	8

(OR)

(b) For the incompletely specified machines as given, find a minimum-state reduced machine containing the original one.

Table 2

PS	NS,z		
	I1	I2	I3
A	C,0	E,1	-
B	C,0	E,-	-
C	B,-	C,0	A,-
D	B,0	C,-	E,-
E	-	E,0	A,-

Rubric	Marks
step marking	8

Section 5 (Answer all question(s))

Marks CO BL

Q18. What are races and cycles? **2 4 3**

Rubric	Marks
Races and Cycles.	2

Q19. (a) (i) Find all the races in the flow table of and indicate those that are critical and those that are not. (ii) Find another assignment that contains no critical races. **8 4 1**

state				
	x1x2			
y1y2	00	01	11	10
00	00	11	00	11
01	11	01	11	11
10	00	10	11	11
11	11	11	00	11

Rubric	Marks
(a) Find all the races in the flow table of and indicate those that are critical and those that are not. (b) Find another assignment that contains no critical races.	8

(OR)

(b) Give a minimum-row reduced-flow-table description of an SIC fundamental-mode two-input (x1, x2), one-output (z) sequential circuit that operates in the following manner: the output z = 1 if and only if the input state x1 = x2 = 1 and the next-to-last input variable change was a change in the value of x1. Assume that the circuit is initially in the input state x1 = x2 = 0. Is the reduced flow table unique?

Rubric	Marks
minimum-row reduced-flow-table description of an SIC fundamental-mode. Is the reduced flow table unique?	8

Section 6 (Answer any 2 question(s))

Marks CO BL

Q20. Explain n-well process with diagram in detail. **5 5 2**

Rubric	Marks
process & diagram	5

Q21. What is meant by fabrication? Explain any five fabrication processes. **5 5 2**

Rubric	Marks
each 1 marks	5

Q22. Draw layout for CMOS inverter. State any five design rules for layout. **5 5 2**

Rubric	Marks
each 1 marks	5

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