VLSI Design Flow

Solution of Mid Semester Exam (27th September 2025)

Time allowed: 1 hour *Maximum Marks: 30*

1.

a.

i. Photoresist
ii. Etching **[0.5X2=1 Mark]**

b. Number of good dies on one wafer = 400*75/100=300
Number of wafer need processing = 300000/300=1000 **[1+1 Marks]**

c.

i. OPC (optical proximity correction)
ii. Multi-patterning/double patterning **[0.5X2=1 Mark]**

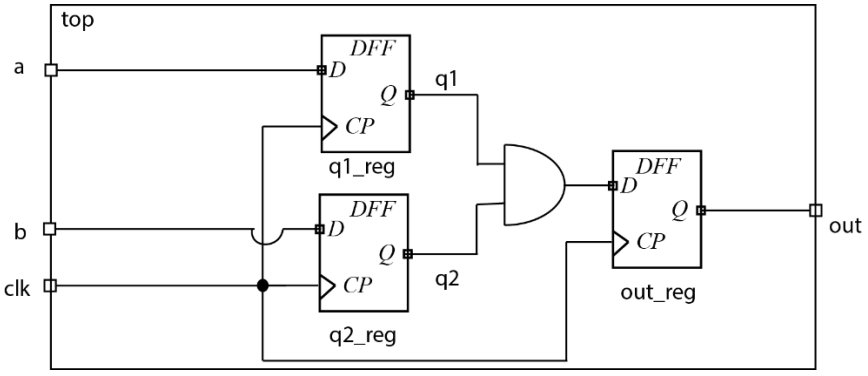
d.

i. High-level Synthesis, HLS, Behavior Synthesis
ii. Hardware-software partitioning
iii. Technology mapping or mapping
iv. Power Planning or Chip Planning
v. Detailed Routing or Routing
vi. Engineering Change Order or ECO **[0.5X6=3 Marks]**

e. a=0 b=1 **[1+1 Marks]**

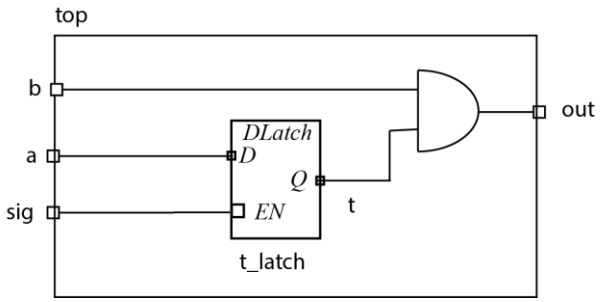
2.

a.



1 Marks for correct port and module names. (-0.2 for missing or wrong port name)
0.5*3=1.5 Marks for each flip-flop with correct connection of D, Q and CP (If anything is wrong for a flip-flop, no marks for that flip-flop)
1.5 if rest is correct (0 otherwise, no step-marking here)

b.



1 Marks for correct port and module names (-0.2 for missing or wrong port name)
1 Marks for latch with correct connection of D, Q and EN (If anything is wrong for the latch, no marks for the latch)
1 if rest is correct (0 otherwise, no step-marking here)

3.

a. 10% to 90% threshold corresponds to 0.8 fraction of the linear ramp.
Hence,
Slew at D = 0.8*30=24 ps **[1 Mark]**
Slew at CP = 0.8*10=8 ps **[1 Marks]**
From the library data, setup time for slew of 24 ps at D and slew of 8 ps at CP = 45 ps **[1 Mark]**

b. From the library data, clock-to-Q delay for slew of 8 ps at CP and load of 20 ff = 35 ps **[2 Marks]**

4.

For path from F1 to F2 for hold:
AT = 30 ps
RT = 20+20+10 = 50 ps
Slack = 30 – 50 = -20 ps **[1+1+1 Marks]**
No step marking for the numbers. If anything wrong in AT, RT, Slack: 0 is awarded

5.

a. For path from F1 to F2 for setup longest data path should be considered:
AT = 40+100+50+100=290 ps
RT = 1000-35=965 ps
Slack = 965 – 290 = 675 ps **[1+1+1 Marks]**

b. For path from F1 to F2 for hold shortest data path should be considered:
AT = 40+100+100=240 ps
RT = 25 ps
Slack = 240 – 25 = 215 ps **[1+1+1 Marks]**
No step marking for the numbers. If anything wrong in AT, RT, Slack: 0 is awarded