

(3 Hours)

[Total Marks: 80]

N.B.: (1) Question No. 1 is **Compulsory**.(2) Attempt any **three** questions out of **remaining five**.

(3) Each question carries 20 marks and sub-question carry equal marks.

(4) Assume suitable data if required.

1. Solve **any 4** of the following; (20)
  - (a) Draw and explain AND gate using pass transistor logic (5)
  - (b) \_\_\_\_\_ (5)  
Implement  $Y = (A+B.C)$  using dynamic CMOS logic.
  - (c) Explain low power design consideration (5)
  - (d) Implement half adder circuit using static CMOS. (5)
  - (e) Draw schematic for 6T SRAM cell and explain its stability criteria (5)
2. (a) Explain concept of precharge and evolution in dynamic CMOS (10)
  - (b) Define scaling? Explain various types of scaling in detail (10)
3. (a) Compare Ripple carry adder and carry-look-ahead adder. Explain 4 bit CLA adder implementation. (10)
  - (b) Explain various techniques of clock generation. Discuss 'H' Tree clock distribution (10)
4. (a) Consider a CMOS inverter circuit with following parameter (10)
 

$V_{Ton} = 0.6V$ ,  $V_{Top} = -0.7V$ ,  
 $\mu_n C_{ox} = 60\mu A/V^2$ ,  $(W/L)_n = 8$   
 $\mu_p C_{ox} = 25\mu A/V^2$ ,  $(W/L)_p = 12$

Calculate noise margins and switching threshold of the inverter. The power supply voltage  $V_{DD} = 3.3V$

  - (b) Implement 4:1 MUX using pass transmission logic. Explain advantages of using transmission gates. (10)
5. (a) Explain Barrel shifter in brief. (10)
  - (b) Draw JK flip flop using CMOS and explain its operation. (10)
6. Write short notes on **any two** of the following: (20)
  - (a) ESD protection techniques
  - (b) Interconnect scaling and crosstalk
  - (c) Sense Amplifier
  - (d) NAND based ROM array.