**Digital/Analog assignment**

**1. If inverted output of D flip-flop is connected to its input how the flip-flop behaves?**

**2. Design a circuit to divide input frequency by 2?**

**3. Design a divide by two counter using D-Latch.**

**4. Design a divide-by-3 sequential circuit with 50% duty cycle.**

**5. Draw a Transmission Gate-based D-Latch? 6. Design an OR gate from 2:1 MUX.**

**7. What is the difference between a LATCH and a FLIP-FLOP?**

**8. Design a D Flip-Flop from two latches. 9. Design a 2-bit counter using D Flip-Flop.**

**10. What are the two types of delays in any digital system?**

**11. Design a Transparent Latch using a 2:1 Mux.**

**12. Design a 4:1 Mux using 2:1 Mux's.**

**13. Design a 3:8 decoder 14. Design a D and T flip flop using 2:1 mux only.**

**15. Design a 4-bit Gray Counter?**

**16. Design 4-bit synchronous counter, asynchronous counter?**

**17. What is asynchronous reset or synchronous reset? Explain difference between two.**

**18. Design a simple circuit based on combinational logic that doubles the input frequency.**

**19. Give two ways of converting a two input NAND gate to an inverter?**

**20. What is the difference between latch-based design and flip-flop-based design?**

**21. Design a four-input NAND gate using only two-input NAND gates.**

**22. How do you detect if two 4-bit signals are same?**

**23. Design all the basic gates NOT, AND, OR, NAND, NOR, XOR, XNOR using 2:1 Multiplexer.**

**24. Design a D-latch using (a) using 2:1 Mux (b) from S-R Latch?**

**25. How to implement a Master Slave flip flop using a 2 to 1 mux?**

**26. Convert XoR gate to buffer and Inverter. 27. How to calculate maximum operating frequency?**

**28. What are the applications of buffer?**

**29. Convert an Inverter into an Oscillator?**

**30. Define Setup and Hold Violations.**

**31. What is the difference between BJT & MoSFET? Why MosFET is preferred over BJT in the contemporary semiconductor world?**

**32. Why is BJT called BiPolar device?**

**33. Why is MoSFET called Unipolar device?**

**34. Why is BJT called Current controlled device?**

**35. Why is MoSFET called Voltage controlled device?**

**36. Define Threshold Voltage of MoSFET.**

**37. Define regions of operation of MoSFET. 38. Explain Channel Length Modulation.**

**39. Explain effect of temperature on MoSFET & BJT Currents.**

**40. Design a frequency divide by 2 circuit using D flipflop and external gates which gives 25% duty cycle.**

**41. Design a counter using D flipflop that counts in the sequence: 0,4,2,7,0,4,2,7,0,4……?**

**42. If each flipflop has a clock to Q delay of 10ns, how much time it will take for output to its next state in Case 1: 4-bit Synchronous Counter, Case 2 : 4-bit Asynchronous Counter.**

**43. Using the external gates and 4bit counter, design a circuit which gives “1”. If the number of clocks are multiplies of 4.**

**44. Design 4 input XOR gate using 2 input XOR gates in all possible ways.**

**45. Design 4 input NAND gate using only 2 input NAND gates.**