Instructions –

(1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(7) Use of Steam tables, logarithmic, Mollier’s chart is permitted.

1. **Attempt any TEN of the following:**

   a) Convert the following hexadecimal number to decimal number

   (i) \((EF)_{16}\)

   (ii) \((DAD)_{16}\)

   b) Convert the following decimal number to octal.

   (i) \((28)_{10}\)

   (ii) \((62)_{10}\)
c) Draw the symbol of EX-OR and EX-NOR gate along with its logical equation.
d) Draw symbol of AND gate and write its truth table.
e) Draw the symbol of D-FlipFlop and T-FlipFlop.
f) Define Bidirectional Shift Register and Universal Shift Register.
g) State different triggering methods in digital circuits.
h) State DeMorgan’s theorems.
i) Convert the following:
   (i) \((111011)_{2} = (\ ? \) gray code
   (ii) \((46)_{10} = (\ ? \) excess-3 code
j) What is Modulus of counter? How many FlipFlops are required for MOD-11 counter.
k) What is Flash Memory?
l) Define Reduction and Linearity of DAC.
m) Implement given logical equation using gates \( Y = AB + C \)
n) Define Accuracy and settling time w.r.t. to DAC.

2. Attempt any **FOUR** of the following: 16

   a) Perform the following:
      \((11011)_{2} \times (11011)_{2}\)

   b) State the rules for BCD Addition explain with example.

   c) Draw and explain the working CMOS inverter with circuit diagram.

   d) Design Half adder using K-map and implement using gates.
e) Realize
\[ F_1 = \Sigma m \ (0, \ 2, \ 4, \ 6) \]
\[ F_2 = \Sigma m \ (1, \ 3, \ 5) \]
using Demultiplexer.

f) Draw and explain S.R. and FlipFlop using NAND gate along with truth table.

3. Attempt any **FOUR** of the following: 16

   a) Draw and explain working of R-2R DAC.

   b) State different types of ROM and explain any one.

   c) Draw circuit diagram of TTL NAND gate and explain its working.

   d) Subtract using 2’s complement method
      (i) \((1110)_2 - (1001)_2\)
      (ii) \((1000)_2 - (1001)_2\)

   e) Draw Master Salve JF FlipFlop and write its truth table.

   f) Design MOD-6 Counter using IC 7490 and write its truth table.

4. Attempt any **FOUR** of the following: 16

   a) Describe working of SISO shift Register with proper circuit diagram.

   b) Compare combinational and sequential circuit. (Four points)

   c) Compare:
      (i) Volatile with Non-Volatile memory.
      (ii) SRAM with DRAM memory.

   d) Explain working of single slope ADC with diagram.
e) Identify the given circuit and explain its working.
(Refer Figure No.1)

![Circuit Diagram]

**Fig. No. 1**

f) Draw and explain working of 4-bit Weighted Register DAC circuit.

5. **Attempt any FOUR of the following:**

   a) Compare TTL logic family with CMOS w.r.t. to
      (i) Propogation delay
      (ii) Power dissipation
      (iii) Fan-out
      (iv) Basic gate

   b) Prove:
      (i) \( A + AB = A \)
      (ii) \( \overline{A + \overline{B} + \overline{C}} = ABC \)

   c) Classify memories and Identify the IC
      (i) IC 2716
      (ii) IC 7481

   d) Design and draw 16:1 MUX using 8:1 MUX (Multiplex).
e) What is priority encodes? How is Demultiplex used as Decoder?

f) Draw block diagram of successive approximation type ADC and write its advantages.

6. Attempt any **FOUR** of the following:  

a) Compare weighted resistor and R-2R methods of ADC.

b) Write std SOP equation of given logical equation
   (i) \( y = AB + BC \)
   (ii) \( y = \overline{ABC} + B \)

c) Minimize \( y = \Sigma m (0, 5, 2, 8, 7, 10, 15, 13) \) using k-map.

d) Write Advantages of MUX and DEMUX state their applications.

e) Identify the given circuit and write its truth table - Diagram below (Refer Figure No.2)

![Diagram](Fig. No. 2)

f) (i) Draw circuit diagram of MOD-10 counter using T-FF.

(ii) Identify the function of

1) IC – 0800

2) IC – 0809