DIGITAL ELECTRONICS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

PART – A

Marks – 25

Answer *all* questions.

1. Multiple choice questions :   1×5=5

   (a) How many entries will be in the truth table of
        a 3 input NAND gate ?

        (i) 3   (ii) 6

        (iii) 8   (iv) 9

   (b) How many bits are required to store one
        BCD digit ?

        (i) 1   (ii) 2

        (iii) 3   (iv) 4

(c) In binary number system the first digit (bit) from right to left is called as

(i) LSB (Least significant bit)

(ii) MSB (Most significant bit)

(iii) First bit

(iv) Last bit

(d) In an SR latch built from NOR gates, which condition is not allowed ?

(i) $S=0, R=0$

(ii) $S=0, R=1$

(iii) $S=1, R=0$

(iv) $S=1, R=1$

(e) Which of these sets of logic gates are designated as universal gates ?

(i) NOR, NAND.

(ii) XOR, NOR, NAND.

(iii) OR, NOT, AND.

(iv) NOR, NAND, XNOR.

2. Fill in the blanks : $1 \times 5 = 5$

   (a) The digit that changes most often when counting, is called the _____ .

   (b) Memory devices that use electronic latching circuits are called _____ .

   (c) If a HIGH logic level is assigned a binary zero (0), and a low level is assigned a binary one (1), the logic is called _____ .

   (d) A binary number can be converted to be viewed on a 7-segment display by a (n) _____ .

   (e) _____ is the highest-value seven-bit binary number.

3. State true or false : $1 \times 5 = 5$

   (a) The voltage levels used to represent binary values (0 and 1) in a digital system are nearly equal in value.

   (b) Temperature variation is normally an analog quantity.

   (c) Transistor-transistor logic (TTL) uses the bipolar transistor as its main circuit element.

(d) With an OR gate, the output is HIGH only when both inputs are HIGH.

(e) Digital circuits cannot perform logic comparisons since the circuit can have only one of two values at any instant.

4. Answer the following questions : $1 \times 10 = 10$

(a) What is the base in binary number system ?

(b) What are the advantages of gray code over binary ?

(c) What is the maximum number that can be counted using 10 bits ?

(d) Give another name for digital circuit.

(e) Which gates can be combined to give a NAND gate ?

(f) What is the full form of ECL ?

(g) How many gates does a full adder have ?

(h) What is tristate logic ?

(i) What is a LCD ?

(j) Draw symbol of a Clock D latch.

PART – B

Marks – 45

Instruction : The answers should be comprehensive and criteria for valuation are the contents but not the length of the answer.

5. Answer any *five* questions of the following :

$$3 \times 5 = 15$$

(a) Convert the decimal numbers 268, 39 into hexadecimal.

(b) What is meant by 1's complements and 2's complements ? Explain.

(c) What is an exclusive NOR gate ? How it can be realized ? Show truth table of 2 inputs X-NOR gate.

(d) Name some important specification of digital IC.

(e) Explain the working of CMOS NAND gate.

(f) Draw the circuit of a full adder and explain its working.

6. Answer any *three* questions of the following :

$$5 \times 3 = 15$$

(a) What are Demorgan's Theorems ? Write them in equation form. Prepare their truth table to prove their correctness.

(b) Plot on Karnaugh Map Y(A, B, C, D) = Σ m(0, 2, 3, 6, 8, 9, 14, 15).

(c) What is an encoder ? Draw the logic circuit of decimal to BCD encoder and explain its working.

(d) Draw common anode circuit of LED seven segment display.

(e) What is JK master slave flip-flop ? Draw its logic circuit and explain its working.

7. Answer any *two* of the following : $7.5 \times 2 = 15$

(a) Draw and explain the logic circuit of a 4:1 multiplexer.

(b) Draw the circuit of a 4-bit ripple counter. Explain its working. Draw its timing diagram.

(d) Explain the various parameters of flip-flops.

(e) What is a register ? What are the various types of registers ? Explain the working of any one of them.

(f) How is computer memory classified ? Explain them.