



BOARD QUESTION PAPER: MARCH 2025

Electronics Paper - II

Time: 3 Hours

Max. Marks: 50

Instructions:

- All questions are compulsory.
- Draw neat labelled diagrams whenever necessary.
- Figures to the right indicate full marks.
- Use of log table is allowed.

- (A) Select correct alternatives from the following sub-questions and rewrite the complete sentences:

(a) The largest 4-bit binary number used in BCD Code is _____. (1)

(i) 1010 (ii) 1001
(iii) 1111 (iv) 1000

(b) In Boolean Algebra $A \oplus \bar{A}$ is always equal to _____. (1)

(i) 1 (ii) 0
(iii) A (iv) $\bar{A}$

(c) The largest binary number counted by a 4 cascaded flip-flop has a decimal equivalent of _____. (1)

(i) 16 (ii) 15
(iii) 8 (iv) 7

(d) A 4-bit weighted resistor D/A converter uses $80\ \Omega$ resistor for LSB. The value of resistor used for MSB is _____. (1)

(i) $640\ \text{K}\ \Omega$ (ii) $10\ \text{K}\ \Omega$
(iii) $40\ \text{K}\ \Omega$ (iv) $20\ \text{K}\ \Omega$

(B) Attempt **any two** of the following:

(a) With suitable examples, explain decimal to hexadecimal conversion. (3)

(b) Draw logic diagram of 4:1 Multiplexer and explain its working with truth table. (3)

(c) Differentiate between Synchronous and Asynchronous Counters. (3)
- (A) Attempt **any two** of the following:

(a) Why NAND gate is called universal building block? Construct AND, OR gate using NAND gate. (3)

(b) Draw basic circuit of TTL NAND gate and explain its working. (3)

(c) What is meant by modulus of a counter? State any four applications of a counter. (3)

(B) Attempt **any one** of the following:

(a) What is a Decoder? Explain BCD to decimal decoder using gates. (4)

(b) Explain the working of counter type analog to digital converter. State its one drawback. (4)
- (A) Attempt **any two** of the following:

(a) Implement the expression using a multiplexer: (3)

$$f(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 10, 14)$$

(b) Draw the circuit diagram of 4 bit binary ladder (R-2R) D/A converter. Obtain equation for output voltage. (3)

(c) Solve the following binary subtraction using 1's complement method: (3)

$$(1001 - 1100)_2$$

(B) Attempt **any one** of the following:

(a) State and prove DeMorgan's theorems. (4)

(b) Draw logic diagram of a JK master-slave flip-flop and explain it with truth table. (4)



4. (A) Attempt **any two** of the following:
- (a) Prove the following identity using Boolean Laws: $A + \bar{A} \cdot B = A + B$ (3)
 - (b) Explain in brief following characteristics of digital ICS: (3)
 - (i) Power dissipation
 - (ii) Figure of merit
 - (iii) Fan-out
 - (c) Find the frequency of MSB output waveform in a 4-bit binary counter if the square wave clock frequency is (i) 32 MHz (ii) 16 MHz (iii) 8 MHz (3)
- (B) Attempt **any one** of the following:
- (a) Explain decimal to BCD encoder using OR gates. Write its truth table. (4)
 - (b) Draw basic block diagram of computer and explain function of each block. (4)
5. (A) Attempt **any two** of the following:
- (a) Solve the following: (3)
 - (i) $(6AD)_{16} = (?)_{10}$
 - (ii) $(1001\ 10000011)_2 = (?)_{16}$
 - (iii) $(BAD7)_{16} = (?)_2$
 - (b) Design 8:1 Multiplexer using two 4:1 Multiplexer ICS. (3)
 - (c) Draw diagram of 4-bit shift left register using D flip-flop. Explain its working. Draw necessary wave form when $D_{in} = 1$. (3)
- (B) Attempt **any one** of the following:
- (a) Explain full-adder with logic diagram, equations and truth table. (4)
 - (b) Write a short note on: (4)
 - (i) Hard Disk
 - (ii) Printer (Any one type)
- OR**
5. (A) Attempt **any two** of the following:
- (a) Explain 1:4 demultiplexer with logic diagram and truth table. (3)
 - (b) Write a note on T-flip-flop with logic circuit. (3)
 - (c) What are the output voltages caused by MSB and LSB in a 4 bit ladder if input levels are 0 = 0V and 1 = + 10V? What if full scale output voltage? (3)
- (B) Attempt **any one** of the following:
- (a) Write a note on BCD and ASCII Code. (4)
 - (b) Draw basic circuits of CMOS Inverter and CMOS NAND gate. (4)