Total number of printed pages–4

44 (Sem–2) DLF (HC–2026/2·3) N/O

2022

DIGITAL LOGIC FUNDAMENTALS

Paper : BCA–HC–2026/BCA–2·3

Full Marks : 80

Time : Three hours

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

1. Fill in the following blanks with appropriate words : $1 \times 10 = 10$

   (i) For a 2 input logic gate the output will be 1 when both the inputs are 1 is _____ gate.

   (ii) The SOP in Boolean logic stands for _____.

   (iii) The _____ gate is known as a universal logic gate.

   (iv) The binary equivalent of decimal 10 is _____.

   (v) If A and B is a Boolean variable then the expression A*B can be realized with _____ logic gate.

Contd.

(vi) A full adder consists of _____ number of inputs and _____ number of outputs.

(vii) A 4:1 multiplexer has 4 inputs data line and _____ input of select lines.

(viii) A R-S flip flop can be considered as _____ circuit.

(ix) A 3-bit ripple counter will have _____ number of logic states.

(x) The storage of 1 KB of memory consists of _____ number of bites.

2. Very short answer type questions : 2×5=10

(a) Convert the following

(i) (1010.1010) binary to decimal,

(ii) (27) decimal to binary

(b) Write the truth table for a 2-input NAND gate.

(c) What is the difference between a latch and a flip-flop ?

(d) Distinguish combinational and sequential logic circuits.

(e) Write down the truth table for a half-subtractor.

3. Short from answer type question : *(answer **any four** questions from the following)* 5×4=20

(i) Write down the two De-Morgan's theorem of Boolean algebra. State and prove the two theorems with appropriate logic circuits.

(iii) What is a full adder logic circuit ? Write the truth table of full adder and design the full adder with appropriate logic diagram.

(iii) What is a flip-flop ? How is it different from a latch ? Discuss the working of R-S flip flop with appropriate timing diagram.

(iv) What is a shift register ? What are the different types of shift registers used in digital system design ? Explain briefly.

(v) What is a don't care variable in a Karnaugh map simplification method ? Discuss the role of a don't care in a 3-variable k-map method.

(vi) Why NAND and NOR gate is called universal logic gates ? Design two input AND, OR and NOT operation using 2-input NAND gate only.

4. Answer ***any four*** from the following : $10\times4=40$

(a) Write a short note on the different postulates and basic theorems of Boolean algebra.

(b) Simplify the following SOP terms using k-map simplification method.

(i) $f(A, B, C)=\sum(0, 2, 4, 5, 7)$

(ii) $f(A, B, C, D)=\sum(1, 4, 5, 7, 10, 11, 12)$

(c) What is a combinational logic circuit? What are the different combinational logic circuits, write a short note on it? Simplify the following Boolean expression. $F = (\overline{A} + B)(A + \overline{C})(\overline{B} + \overline{C})$

(d) What is a sequential logic circuit? What is J-K flip flop? Write the truth table of a J-K flip flop and discuss its operation.

(e) What is binary counter? What is the difference between asynchronous counter and synchronous counter? Design a 3-bit ripple counter with its circuit diagram.

(f) Write a short note on *any two* of the following :

(i) Serial-in, serial-out shift register

(ii) Parallel-in parallel-out shift register

(iii) 3-to-8-line decoder

(iv) 4:1 multiplexer