ANANDARAM DHEKIAL PHOOKAN COLLEGE LIBRARY
Acc. No.
Date
Nagaon · Assam

**2026**

PHYSICS

( Major )

Paper : PHY0600204

**( Digital Electronics )**

*Full Marks* : 45

*Time* : 2 hours

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

**1.** Answer the following as directed : 1×5=5

*(a)* In an IC, silicon dioxide ($SiO_2$) acts as

*(i)* a substrate layer

*(ii)* an insulating layer

*(iii)* a transistor

*(iv)* a resistor

( Choose the correct option )

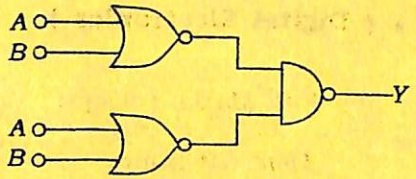
(b) BCD code is also called _____ code.

( Fill in the blank )

(c) Sequential circuits are slower than the combinational circuits.

( State True or False )

(d) For the given circuit diagram




the output $Y$ is

(i) $A+B$

(ii) $AB$

(iii) $\overline{A+B}$

(iv) $\overline{A \cdot B}$

( Choose the correct option )

(e) The storage capacity of each stage in a shift register is _____ bits.

( Fill in the blank )



( Continued )

PRAKASH DHEKIAL PHUKAN COLLEGE LIBRARY
Acc. No.
Date
Nagaon Assam



**2.** Answer any *five* of the following questions : 2×5=10

(a) Convert the following hexadecimal numbers to binary :

(i) D45

(ii) AC3·6

(b) Obtain the SOP form of the function

$$Y = AB + ACD$$

(c) Simplify the following expression with the help of Boolean algebra rules :

$$Y = ABC[AB + \overline{C}(BC + AC)]$$

(d) Using 2's complement, perform the subtraction

$$(19)_{10} - (25)_{10}$$

(e) Draw the external circuit diagram of an IC 555 used as an astable multivibrator.

(f) Draw the logic diagram of a clocked *S-R* flip-flop. Write the characteristic equations of *S-R* flip-flop.



( Turn Over )

(g) What are shift registers? What are the basic types of shift registers?

(h) Mention two differences between active and passive components of IC.

(i) What are low- and high-level languages? Give examples.

(j) Draw the logic symbol of XOR gate and construct the truth table.

**3.** Answer any *four* of the following questions : 5×4=20

(a) Using NAND gates only, realize the following gates :

(i) AND

(ii) OR

(iii) NOT



( Continued )

PHUKAN DHEKIL PHOOKAN COLLEGE LIBRARY
Acc. No.
Date
Nagaon Assam



(b) Draw the logic circuit for the following function using NOR gates :

$$(A+B)(B+C)(A+C)$$

(c) Simplify the Boolean function

$F(A, B, C, D) = \Sigma m(7, 9, 10, 11, 12, 13, 14, 15)$

with the help of K-maps.

(d) Express the function $Y = A + \overline{B}C$ in *(i)* canonical SOP and *(ii)* canonical POS forms.

(e) Explain the function of a *D* flip-flop using a suitable diagram. Write the characteristic table of a *D* flip-flop.

(f) What is half adder? Draw the logic diagram and write the truth table of a half adder.

(g) Distinguish between static RAM and dynamic RAM. What is a cache memory? What is its function?



( Turn Over )

(h) Distinguish between combinational and sequential logic circuits. What do you mean by latch? Draw the circuit diagram of a bistable multivibrator of a flip-flop.

4. Answer any *one* of the following questions : 10

(a) Draw the block diagram and truth table of a full subtractor. Design a full subtractor logic circuit by using K-map. 5+5=10

(b) (i) Draw the logic diagram of a master-slave *J-K* flip-flop and explain its operation with the help of a truth table. 6

(ii) What is race-around condition of a *J-K* flip-flop? How is the race-around condition eliminated? 4

(c) Draw the pinout diagram of IC 555. Explain the working of an astable multivibrator with duty cycle more than 50% using IC 555 timer and draw the relevant waveforms. 2+8=10



( Continued )



(d) Write short notes on any *two* of the following : 5×2=10

(i) Full Adder

(ii) CPU and ALU

(iii) Serial-In Serial-Out Shift Register

(iv) MAR and MDR

★★★

DHEKIL PHOOKAN COLLEGE LIBRARY
Acc No.
Date
Nagaon Assam