(vi) What is a microprocessor ? What is the difference between microprocessor and microcomputer ? Write the basic features of Intel 8085 microprocessor. 1+1+8=10

(vii) (a) Give the symbol and truth table of XNOR gate.

(b) Realize the NOT gate using transistor.

(c) What are preset and clear operations ? 3+3+4=10

(viii) (a) What do you mean by the following terms used in a Microprocessor ?

(i) Buses

(ii) Registers

(iii) ALU

(b) What is a Half Subtractor ? Give the symbol and the truth table. 6+4=10

3 (Sem-3/CBCS) PHY HC 3

2022

PHYSICS

(Honours)

Paper : PHY-HC-3036

(Digital Systems and Applications)

Full Marks : 60

Time : Three hours

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

1. Answer the following questions as directed : 1×7=7

(any seven)

(i) The deflection sensitivity of a CRO can be enhanced by reducing _____.

(Fill in the blank)

(ii) The intel 8085 microprocessor is a 16 bits processor.

*(State True **or** False)*

(iii) The design of flip-flops are based on

(a) Sequential logic

(b) Multiplexing

(c) Combinational logic

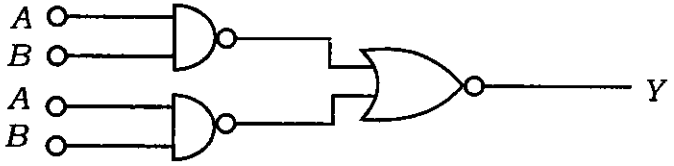
(d) Demultiplexing

(Choose the correct option)

(iv) The full form of MDR is _____.

(Fill in the blank)

(v) For the given circuit diagram, the output Y is



(a) $A + B$

(b) AB

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

(d) $\overline{A.B}$

(Choose the correct option)

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

(Fill in the blank)

(vii) Monostable multivibrators can be used as frequency divider by using

(a) Sawtooth wave generator

(b) Triangular wave generator

(c) Sine wave generator

(d) Square wave generator

(Choose the correct option)

(viii) What is the full form of VLSI ?

(ix) Mention *one* advantage of a digital circuit over an analog circuit.

(x) Write the names of an active component and a passive component in a circuit.

(xi) Convert the binary number 101.11_2 into decimal number.

(xii) Convert the decimal number 54.50 into binary number.

2. Answer the following questions in brief : **(any four)** 2×4=8

(i) Convert the following hexadecimal numbers to binary

(a) B32

(b) AE2·4

(ii) Reduce the following Boolean function

$$A\overline{B} + \overline{A}B + AB + \overline{A}\overline{B}$$

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

101·1101 – 101·0111

(iv) What do you mean by D/A converter ? Name *two* types of D/A converter.

(v) What is synchronous counter ? Write *two* basic applications of counters.

(vi) What is Primary memory ? What is its function ?

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

(viii) Mention *two* applications of Multiplexers.

3. Answer **any three** questions from the following : 5×3=15

(i) (a) Convert the following Boolean expression into standard SOP form

$$A + \overline{B} + CA$$

(b) Show that $\left(\overline{AC} + B\right)\left(\overline{\overline{A} + \overline{C}}\right) = BAC$

(ii) Explain how SR flip-flop is obtained from using NAND gates. Draw the truth table.

(iii) With neat diagram explain the working of a serial-in parallel-out shift register. What is the basic difference between a shift register and a counter ?

(iv) Simplify the Boolean function $F(A, B, C, D) = \sum(0,1,2,4,5,6,8,9,12,13,14)$ with the help of K-maps.

(v) Write short notes on : **(any one)**

(a) BCD decade counter

(b) Astable Multivibrator

(c) Clocked D flip-flop

(vi) Define Opcode and Operand. Write an 8085 Assembly Language Program (ALP) to store data of register C into memory location 2054H. 2+3=5

(vii) Prove the following equations with the help of truth tables :

(a) $\overline{A+B} = \overline{A}.\overline{B}$

(b) $\overline{A.B} = \overline{A}+\overline{B}$

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

(a) AND

(b) OR

(c) NOT

4. Answer ***any three*** of the following questions : 10×3=30

(i) What are decoders and encoders ? With the help of a logic diagram and truth table explain. 2+4+4=10

(a) 2 to 4 decoder

(b) Octal to binary encoder.

(ii) What is a full Adder ? Draw the block diagram and truth table of a full Adder. Design a full Adder logic circuit by applying Karnaugh map. 1+4+5=10

(iii) (a) Draw the K-map to minimize the following expression.

$\overline{A}\overline{B}\overline{C} + A\overline{B}\overline{C} + \overline{A}B\overline{C} + AB\overline{C}$

(b) For the given truth table, find the minimized logical expression by the use of K-map and SOP method and draw the equivalent logic circuit : 4+6=10

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

(iv) With the help of a logic diagram and function table explain 5×2=10

(a) 1 to 2 Demultiplexer

(b) 2 to 1 Multiplexer.

(v) Draw the block diagram of a CRO. What is the function of electron gun in a CRO ? Explain how the phase difference between two sinusoidal voltages of the same frequency and same amplitude can be determined by using CRO. 3+2+5=10