2024

B.A./B.Sc.

Fourth Semester

CORE – 10

PHYSICS

Course Code: PHC 4.31

(Digital Systems & Applications)

Total Mark: 70 *Pass Mark: 28*

Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Explain the working of the transistor as a switch with a suitable diagram. 5
   (b) Draw a NOT, OR, AND, NAND and XOR using NOR as a universal gate. 5
   (c) Convert decimal 23 into its binary equivalent number. 1
   (d) Convert 7046_{10} to hexadecimal. 1
   (e) Convert 1111100001010001_2 to hexadecimal. 1
   (f) Subtract the binary numbers 01010010 and 01001010. Express the result in decimal value. 1

2. (a) Draw a two input positive-logic diode AND circuit and explain its operation. 5
   (b) Discuss the working of a TTL NAND gate. 5
   (c) With the aid of a neat diagram explain the operation of a CMOS logic circuit. 4

UNIT–II

3. (a) Simplify the Boolean equation
   $Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + AB\bar{C}$. 2
   (b) Prove that $A(\bar{A}+C)(\bar{A}B+C)(\bar{A}BC+\bar{C}) = 0$. 3
   (c) Discuss half-subtractor with a circuit diagram and truth table. 5

(d) Minimize the expression

$Y = F(A, B, C) = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C$ using Karnaugh map 4

4. (a) What is a demultiplexer? Explain the working of a 4 to 1 multiplexer. 1+5=6

(b) Explain how 4-bit parallel adder perform the addition of two 4-bit numbers. 6

(c) Find the complement of $Y = ABC + AB\bar{C} + \bar{A}\bar{B}C + \bar{A}BC$. 2

UNIT–III

5. (a) Explain the working of RS flip-flop and discuss its truth table. 7

(b) Design a monostable multivibrator using IC 555 and explain its operation. 7

6. (a) Explain the working of SISO and PIPO shift register. 8

(b) What is race-around condition? Describe how racing is overcome in master-slave JK flip-flop. 6

UNIT–IV

7. (a) Discuss a 3-bit binary synchronous counter. 7

(b) What is a memory map? List its functions, benefits, and usage. 1+2+2+2=7

8. (a) Write a short note on Johnson counter. 4

(b) Draw the block diagram of ROM. List the types of ROM and their characteristics. 3

(c) Explain the working of memory organization. Draw the internal structure of 16 × 4 memory chip. 5+2=7

UNIT–V

9. (a) Describe 8085 machine cycles and timing diagram. 7

(b) Write an assembly language program to add two 8-bit numbers which are stored in memory locations 2000H and 2001H. 2

(c) Discuss 1-byte, 2-byte, and 3-byte instructions with the help of an example. 5

10. (a) Explain the working of microprocessor instruction in 8085. 5
(b) Draw the timing diagram of MOV A, B instruction and explain it. 4
(c) A memory bank uses a 16-line address bus and 8-line data bus. The first 32 KB of the memory is allocated to two ROMs of 16 KB each, and the remaining space to the RAMs of 8KB each. Write down the initial and final addresses of each chip in the entire memory map 5