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3 SEM TDC PHYH (CBCS) C 7

2023

(Nov/Dec)

PHYSICS

(Core)

Paper : C–7

(Digital Systems and Applications)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer (any *five*) : 1×5=5

(a) In CRO the signal to be examined is usually applied to the

(i) vertical deflection plates

(ii) horizontal deflection plates

(iii) time-base generator circuit

(iv) electron gun and deflecting system

(b) The material used in an IC as insulating layer is

(i) germenium (Ge)

(ii) silicon dioxide (SiO_2)

(iii) silicon (Si)

(iv) both germenium (Ge) and silicon (Si)

(c) What is the decimal number represented by the BCD code 0101 1001 0110?

(i) $(596)_{10}$

(ii) $(2626)_{10}$

(iii) $(695)_{10}$

(iv) $(112112)_{10}$

(d) The sum of minterms of the Boolean expression $F = A + \bar{B}C$ is

(i) $\Sigma m(1, 4, 5, 6, 7)$

(ii) $\Sigma m(1, 4, 5, 6, 8)$

(iii) $\Sigma m(0, 2, 3)$

(iv) $\Sigma m(0, 2, 4)$

(e) Which of the following is responsible for converting the input data into a machine language?

(i) Arithmetic and Logic Unit (ALU)

(ii) Memory Unit

(iii) Input Unit

(iv) Output Unit

(f) The program counter in 8085 micro-processor is a 16-bit register, because

(i) there are 16-address lines

(ii) it counts 16-bit at a time

(iii) it facilitates the users storing 16-bit data temporarily

(iv) it has to fetch two 8-bit data at a time

2. Draw the block diagram of a CRO and mention the basic components of it. 2

3. What are the basic steps involved in fabricating a monolithic integrated circuit? 2

4. Show that NAND and NOR gates are universal logic gates. 2

5. How can NOT gate be realized from transistor? Draw the circuit diagram and construct the truth table. 1+2=3

Or

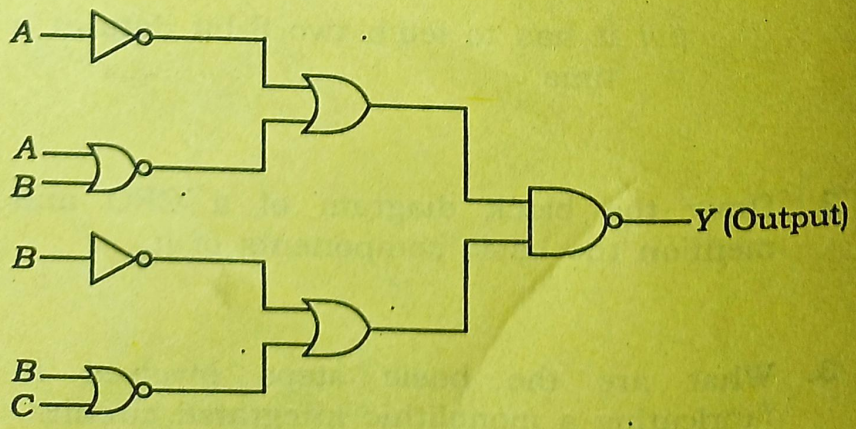
Convert—

(a) $(A2E)_{16}$ to decimal;

(b) $(8436{\cdot}73)_8$ to binary;

(c) $(0{\cdot}125)_{10}$ to binary. 1+1+1=3

6. Write the Boolean expression for the logic diagram given below. Simplify it by using De Morgan's laws and draw the simplified logic diagram : 1+2+1=4



Or

Use Karnaugh map (K-map) to minimize the expression

$$Y = \bar{A}\bar{B}\bar{C} + ABC + A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C} + A\bar{B}C + \bar{A}\bar{B}C$$

and prove the expression given below by using truth table : 2+2=4

$$\bar{A}\bar{B} = \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C}$$

7. What is a multiplexer? Discuss about 4 to 1 MUX by drawing its symbol, logic diagram and truth table. 1+2=3

Or

What is an encoder? Discuss about the octal-to-binary encoder. 1+2=3

8. *(a)* Subtract 100001 from 1010010 by 1's complement method and 2's complement method and verify the result. 3

(b) What is the limitation of a half-adder? Write the truth table of a full-adder. 1+1=2

9. What is race-around condition of a *J-K* flip-flop? Explain the operation of master-slave *J-K* flip-flop with its diagram and truth table. 1+4=5

Or

Write the difference between *S-R* flip-flop and *D*-flip-flop with circuit diagram, logic diagram and truth table. 2+3=5

10. Draw the block diagram of a 555-timer and explain its operation. 3

Or

Explain the working of an astable multivibrator with duty cycle more than 50% using 555-timer.

11. Draw the logic diagram of a serial-in-serial-out (SISO) or parallel-in-parallel-out (PIPO) shift register. 2

12. What is a decode counter? Draw the characteristic table of a 4-bit decode counter. 1+2=3

13. *(a)* What is the difference between a ROM and a RAM? Write about central processing unit of a computer. What is cache memory? 1+2+1=4

(b) What are the components of 8085 microprocessor? Discuss the functions of different buses with a structure diagram of bus. 2+1=3

(Continued)

Or

Discuss the functions of ALE, WR, RD, S_0 and S_1 in a microprocessor. 3

(c) What are the different instructions of 8085 microprocessor according to word size? Discuss about them briefly. 1+2=3

14. Draw and explain the timing diagram for the instruction MVI M, data. 4

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