# 2023

## PHYSICS

Paper : PHYHC3076

**( Digital Systems and Applications )**

*Full Marks* : 60
*Pass Marks* : 24

*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)* The input impedance of CRO is

*(i)* around one ohm

*(ii)* around one mega ohm

*(iii)* around one kilo ohm

*(iv)* around one giga ohm

*(b)* It is not possible to produce ICs of power rating more than

*(i)* 1 watt

*(ii)* 10 watt

*(iii)* 100 watt

*(iv)* 1000 watt

(c) The number system which uses alphabets as well as numerals to represent its digits is

(i) octal

(ii) decimal

(iii) alphanumeric code

(iv) hexadecimal

(d) The logic gate that provides high outputs for same inputs is

(i) NOR

(ii) NAND

(iii) XOR

(iv) XNOR

(e) In which operation carry is obtained?

(i) Subtraction

(ii) Addition

(iii) Multiplication

(iv) Both addition and subtraction

(f) How many select lines would be required for an 8-line to 1-line multiplexer?

(i) 2

(ii) 3

(iii) 8

(iv) 1





(g) What does the bubble at the left of a triangle on the clock of a flip-flop mean?

(i) Level triggered

(ii) Edge triggered

(iii) Positive edge triggered

(iv) Negative edge triggered

(h) Astable mode is also called

(i) bounded

(ii) free running

(iii) neutral

(iv) single

(i) The type of register used to construct a ring counter is

(i) SISO

(ii) SIPO

(iii) PISO

(iv) PIPO

(j) Ripple counters are called

(i) SSI counters

(ii) asynchronous counters

(iii) synchronous counters

(iv) VLSI counters

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

*(a)* What are the advantages of CRO in comparison to multimeter?

*(b)* List out at least two disadvantages of IC.

*(c)* Convert the following hexadecimal numbers to decimal numbers : 1+1=2

*(i)* $(FE7)_{16}$

*(ii)* $(3C.2A)_{16}$

*(d)* What do you mean by duality principle in Boolean algebra?

*(e)* What do you mean by an encoder? What are its different types? 1+1=2

*(f)* What is a race around condition? How can it be corrected? 1+1=2

*(g)* Define 'Opcode' and 'Operand'. 1+1=2

**3.** Answer any *five* of the following questions : 5×5=25

*(a)* Realize with figures 2-input AND gate both for diodes and transistors, also draw the truth table of it. 2+2+1=5

*(b)* What is de-multiplexer? Draw the circuit of 1-4 de-multiplexer, explain its working with truth table. 1+1+2+1=5

*(c)* Write in brief about computer memory mentioning its different types.





*(d)* What are the different software tools for assembly language programming? Write in brief about them. 2+3=5

*(e)* What do you mean by *R-S* flip-flop? Realize *R-S* flip-flop with NOR gates and describe its different input conditions. 1+2+2=5

*(f)* What is an adder? Draw the full-adder circuit and show its detail input and output with appropriate truth-table. 1+2+2=5

*(g)* Convert the following Boolean function into standard sum of products and express it in terms of minterms :

$Y(A, B, C) = AB + A\bar{C} + BC$ 2½+2½=5

*(h)* What is a decade counter? Draw its circuit. Write its truth-table mentioning its working. 1+2+2=5

*(i)* What are different types of measurement of phase difference by a CRO? Explain any one of them. What is the difference between CRO and a DSO? 1+3+1=5

**4.** Answer any *two* of the following questions : 10×2=20

*(a)* Draw the neat block diagram of 8085 microprocessor. Explain its different components. 5+5=10

(b) Describe a monostable multivibrator using IC555 timer with necessary circuit diagram. What is time delay? A monostable multivibrator has $R = 120$ K and the time delay $T = 1000$ ms, calculate the value of C. 6+2+2=10

(c) What is a K-map? Write in detail how will you roll out a K-map from the following 2-variable and 3-variable truth-tables. 2+3+5=10

(i)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

(ii)

| A | B | C | Y |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |



( Continued )



(d) Write short notes on the following : 5×2=10

(i) Integrated circuit

(ii) Theorems of Boolean algebra with examples

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