

U.G. 2nd Semester Examination - 2022

PHYSICS

[PROGRAMME]

Course Code : PHY-G-CC-T-02

(Digital Systems & Applications)

SET-IV

Full Marks : 40

Time :  $2\frac{1}{2}$  Hours

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

GROUP-A

1. Answer any **five** questions:  $2 \times 5 = 10$
- a) What is the difference between analog and digital circuits?
  - b) What do you mean by positive logic and negative logic?
  - c) Which gates are called universal logic gates and why?
  - d) Write down the two De Morgan's theorem.
  - e) What do you mean by bit, nibble and byte?

- f) Convert binary 110.001 to a decimal number.
- g) What is the primary difference between a JK and an RS flip-flop?
- h) How does a synchronous counter differ from an asynchronous counter?

GROUP-B

2. Answer any **two** questions:  $5 \times 2 = 10$
- a) What are minterms? How many fundamental products are there for  $n$  variables? Let us suppose that a three-valuable truth table has a high output for these input conditions: 000, 010, 100 and 110. What is the sum-of-products circuit?  $1+1+3$
  - b) What is a multiplexer? Explain with the help of truth table and logic circuit how a 4-to-1 multiplexer works.  $1+4$
  - c) What do the letters R and S stand for in the term "RS flip-flop"? Explain the operation of the master-slave flip-flop.  $1+4$
  - d) What is an encoder? Explain how the decimal digits 0 to 9 can be encoded using basic gates.  $1+4$

### GROUP-C

3. Answer any **two** questions:  $10 \times 2 = 20$

a) Prove that  $A(\bar{A}+C)(\bar{A}B+C)(\bar{A}BC+\bar{C})=0$ .

Write down a summary of the Karnaugh-map method for simplifying Boolean equations. Subtract 16 from 83 by using 2's complement representation.  $3+3+4$

b) A shift register has eight flip-flops. What is the largest binary number that can be stored in it? Name the four basic types of shift registers and draw a block diagram for each. Derive an expression for deflection sensitivity of a CRT using electrostatic deflection.  $1+4+5$

c) Draw the logic diagram, truth table and waveforms for a two-flip-flop ripple counter. Draw the circuit diagram of an astable multivibrator using IC 555 timer and explain its working principle. Convert the binary number 1011110001.1001101 into its hexadecimal equivalent.  $3+5+2$

d) Prove the Boolean identity  $AB + \bar{A}\bar{B} = \overline{(\bar{A}\bar{B} + \bar{A}B)}$ . What is a decoder? Explain with logic circuit how BCD digits can be decoded as decimal digit. Give the pinout diagram of Intel 8085 microprocessor and identify the functions of each pin.  $2+1+3+4$