

U.G. 3rd Semester Examination - 2020

PHYSICS

[HONOURS]

Course Code : PHY-H-CC-T-07

(Digital Systems and Applications)

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: 2×5=10
- a) What is the time base in a CRO? What is the main component of a CRO?
 - b) What are analog and digital circuits? Give examples.
 - c) What do you mean by bit and byte?
 - d) NAND and NOR gates are called universal gates-why?
 - e) Convert the decimal number 23.8125 into its binary equivalent.

[Turn over]

- f) What are encoder and decoder?
- g) What is the difference between a sequential logic system and a combinational logic system?
- h) What do you mean by a 8-bit microprocessor?

GROUP-B

2. Answer any **two** questions: 5×2=10
- a) i) Explain how the frequency of an A.C. signal can be measured by a CRO.
 - ii) Explain briefly how a waveform is displayed on the screen of a CRO. 3+2
 - b) i) State and prove De Morgan's theorems.
 - ii) Find the hexadecimal equivalent for the decimal number 581. 4+1
 - c) i) Verify the Boolean identities:
 - a) $AB + AC + B\bar{C} = AC + B\bar{C}$
 - b) $AB + \bar{A}C = (A + C) + (\bar{A} + B)$
 - ii) What is a flip-flop? What is its importance in a digital system? 3+(1+1)
 - d) i) What are half adder and full adder? Draw the logic block diagram for adding two decimal numbers 7 and 12.

- ii) What is a demultiplexer? Give the circuit diagram of a 1-line to 4-line demultiplexer using basic gates. 3+2

GROUP-C

3. Answer any **two** questions: 10×2=20
- a) i) With the help of a truth table explain the operation of a JK flip-flop having **preset** and **clear** input facilities.
- ii) What is meant by race-around condition? How it can be avoided? What do you mean by edge triggering? 6+(1+1+2)
- b) i) What is a synchronous counter? What is its advantage over asynchronous counter? Draw a block diagram of a 3-bit synchronous counter and explain its operation with the necessary timing diagram.
- ii) 'An equality detector gives an output if the inputs **A** and **B** are both **1** or if **A** and **B** are both **zero**'. Implement the circuit. (1+1+5)+3
- c) i) What do you mean by ROM and RAM? What is a computer bus? What are address bus and

data bus of a microprocessor? What do you mean by bus width?

- ii) How can a NOT gate be obtained from a NAND gate? Show that an AND gate can be built with NAND gates.

$$(2+1+2+1)+(2+2)$$

- d) i) Subtract $(1011)_2$ from $(11001)_2$ and convert the result into the corresponding decimal number. Convert the hexadecimal number **C5E2** into a binary number.
- ii) What is a multivibrator? Name the different classes of multivibrators and briefly distinguish between them. What are **half** and **full** subtractor? (2+2)+(1+3)+2
