

U.G. 3rd Semester Examination - 2021**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
- What do you mean by 'digital' and 'analog' circuits? Give examples.
 - Distinguish between a CRT and a CRO.
 - Define 'deflection sensitivity' and 'deflection factor'.
 - What are 'active' and 'passive' components in an electronic circuit?
 - What do you mean by 'positive' and 'negative' logic systems?

- Define 'byte', 'bit', 'word' and 'nibble' in a microprocessor.
- Convert the binary number '11.1101' to its decimal equivalent.
- What is a flip-flop? What is a Full Adder?

GROUP-B

2. Answer any **two** questions: 5×2=10
- What are the main components of a CRT? Distinguish between electrostatic and magnetic deflections. 2+1+2
 - In connection with a CRO, explain the following terms: sweep voltage, synchronization, time base and blanking.
 - What are meant by 'Min terms' and 'Max terms'? What is a 'Karnaugh map'?
 - Explain with a suitable example how Karnaugh map can be used to simplify logical expressions. 2+3
 - What is the difference between a 'Half Subtractor' and a 'Full Subtractor'? What is VLSI technology?

- ii) What is a 'multiplexer'? Design a 4:1 multiplexer using basic gates and explain its operation. 2+3
- d) i) Simplify the Boolean function, $X = \bar{A}\bar{B}C + A\bar{B}C + \bar{A}B\bar{C}$ and draw a simplified logic circuit.
- ii) Explain the terms- low level language, high level language, compiler and interpreter related to a computer system. 3+2

GROUP-C

3. Answer any **two** questions: 10×2=20
- a) i) What is a register? Construct a 4-bit shift register using D-type flip-flops and explain its operation.
- ii) What is a counter? Explain the operation of a ring counter with necessary circuit and timing diagram. 1+4+1+4
- b) i) What is an encoder? Explain how the decimal digits 0 to 9 can be encoded as BCD using basic gates.
- ii) What is a BCD system? Draw a logic circuit using 2-input NANDs only to implement the Boolean expression, $Y = AB + BC + CA$. Convert $(1557)_8$ to HEX. 1+4+1+3+1

- c) i) Implement the Boolean expression, $Y = (A+B)(\bar{A}+\bar{B})$ in a logic diagram. Construct the truth table and hence show that the logic diagram is equivalent to an XOR gate.
- ii) Verify the Boolean identities:
 x) $(A+B)(A+C) = A+BC$;
 y) $(A+B)(B+C)(C+A) = AB + BC + CA$.
 2+2+2+2+2
- d) i) What do you mean by a microprocessor? How many different instructions are possible in an 8-bit microprocessor? What are volatile and non-volatile memories? What do you mean by PROM and EPROM?
- ii) Define a sequential logic system. Give an example. How does it differ from a combinational logic system? What is a monostable multivibrator?
 1+1+2+2+1+1+1+1