2022

(Held in 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 : 1×5=5

(a) The active components in an IC are

(i) diodes

(ii) capacitors

(iii) transistors and diodes

(iv) None of the above

(b) According to Boolean law, $A+1=?$

(i) 1

(ii) 0

(iii) A

(iv) $\overline{A}$

(c) A decoder converts n inputs to maximum of _____ outputs.

(i) n

(ii) n^2

(iii) 2^n

(iv) n^{-1}

(d) How is a *J-K* flip-flop made to toggle?

(i) $J=0, K=0$

(ii) $J=1, K=1$

(iii) $J=1, K=0$

(iv) $J=0, K=1$

(e) Assembly language programs are written using

(i) HEX code

(ii) ASCII code

(iii) mnemonics

(iv) None of the above

2. Answer the following questions : 2×5=10

(a) What do you mean by rise time of a CRO? How is bandwidth of a CRO related to its rise time? 1+1=2

(b) In basic IC terminology, what are 'wafer' and 'chip'? Define those. 1+1=2

(c) Convert the following hexadecimal numbers into binary numbers : 1+1=2

(i) $(7A\cdot 2C)_{16}$

(ii) $(FF8)_{16}$

(d) What is a multiplexer? Draw the circuit of a 4-1 multiplexer. 1+1=2

(e) Write the difference between combinational circuits and sequential circuits. 2

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

(a) What is the drawback of *J-K* flip-flop? How is it overcome in master-slave *J-K* flip-flop? Explain it with necessary circuit diagram and truth table. 1+4=5

(b) Describe an astable multivibrator using IC 555. 5

(c) What do you mean by shift register? What are its different types? Draw the circuit symbol of each type. 1+1+3=5

(d) Write briefly on the bus structure of microprocessor. 5

(e) Draw the block diagram of a CRO and label its different parts. What is electron gun? 3+2=5

(f) What is a ring counter? Describe its construction and working. 1+4=5

(g) What do you mean by decoder? Describe a 2-4 decoder. 1+4=5

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

(a) What is a K-map? Define pair, quad, octet, redundant groups with examples in K-map. 1+9=10

(b) Write short notes on any *two* of the following : 5×2=10

(i) Computer memory

(ii) Assembly language

(iii) Full-adder

(c) (i) Realize two-input NAND and NOR gates with diodes and transistors. Write their truth tables. 1+1+1+2=5

(ii) What do you mean by parity? Write its importance in digital electronics. What are its different types? 1+2+2=5

★★★