3 (Sem–3/CBCS) PHY HC 3

2021

(Held in 2022)

PHYSICS

(Honours)

Paper : PHY–HC–3036

(Digital Systems and Applications)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following as directed : 1×7=7

(i) The active components of an IC are _____. *(Fill in the blank)*

(ii) Which of the following gates cannot be used as an inverter ?

(a) NOR

(b) NAND

(c) X-NOR

(d) AND

(Choose the correct option)

(iii) The intensity of the spot in a cathode ray tube can be controlled by changing the positive potential on the control grid. *(State True **or** False)*

(iv) 8421 code is _____ code.

(Fill in the blank)

(v) A flip-flop can store —

(a) one bit of data

(b) two bits of data

(c) three bits of data

(d) any number of bits of data

(Choose the correct option)

(vi) Each term in the standard SOP form is called a _____. *(Fill in the blank)*

(vii) How many buses are connected as part of the 8085 A microprocessor ?

(a) 3

(b) 4

(c) 5

(d) 6

2. Answer the following questions is brief : 2×4=8

(i) What are linear and digital ICs ? Give examples of them.

(ii) Convert the following decimal numbers into BCD code :

(a) 2579

(b) 29·6

(iii) Write down the Boolean expression for 4 to 1 multiplexer and draw the function table for it.

(iv) What are low and high level languages ? Give examples.

3. Answer ***any three*** questions from the following : 5×3=15

(i) Convert the following as directed :

(a) Octal 526 to decimal

(b) Octal 356·52 to binary

(c) Hexadecimal 12A to decimal

(ii) Distinguish between combinational circuits and sequential circuits with examples.

(iii) Design a circuit that gives an output $A\overline{B} + \overline{A}B$ using discrete electronic circuits.

(iv) What is race around condition of a JK flip-flop ? How can it be eliminated?

(v) State De Morgan's theorem. Apply De Morgan's theorem to the following expressions :

(a) $\overline{(A+\overline{B})(\overline{C}+D)}$

(b) $\overline{(\overline{AB}+\overline{CD})(CD+\overline{E}F)}$

4. Answer ***any three*** of the following questions: 10×3=30

(i) Draw the block diagram and truth table of a full subtractor. Design a full subtractor logic circuit by using K-map. 5+5=10

(ii) (a) Use the K-map to minimise the following expressions : 6

i. $X = A\overline{B} + B\overline{C} + \overline{A}C + AB$

ii. $X = \overline{A}\overline{B}\overline{C} + \overline{A}BC + A\overline{B}C + ABC$

(b) Express the Boolean function $F = BC + \overline{B}A$ in a product of maxterms (POS). 4

(iii) (a) Draw the logic diagram of a master-slave JK flip-flop and explain its operation with the help of a truth table. 6

(b) Distinguish between an encoder and a decoder. 4

(iv) (a) Write down the function of CPU and ALU of a computer.

(b) Distinguish between dynamic RAM and static RAM.

(c) What is a cache memory ? What is its function ?

4+3+3=10

(v) (a) Draw the block diagram of a microprocessor.

(b) Explain the function of a program counter in a 8085 microprocessor.

(c) Write different flag registers of a 8085 microprocessor.

(d) What are different types of addressing mode in 8085 microprocessor ?

(e) Give an example of a 3-byte instruction.

2+3+2+2+1=10