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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 : $1 \times 7 = 7$

(i) The active components of an IC are _____.

(Fill in the blank)

Contd.

(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 in brief :

$2 \times 4 = 8$

(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 : $5 \times 3 = 15$

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

(b) $\overline{(\bar{A}\bar{B} + \bar{C}\bar{D})(CD + \bar{E}\bar{F})}$

4. Answer **any three** of the following questions:

$10 \times 3 = 30$

(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. $X = A\bar{B} + B\bar{C} + \bar{A}C + AB$

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

(b) Express the Boolean function $F = BC + \bar{B}A$ 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.

$$2+3+2+2+1=10$$
