SEAT No._____

[57]

SARDAR PATEL UNIVERSITY
S. Y. B.Sc. Examination, Semester III
Date & time: June ,16th 2022 (Thursday),12:00 p.m. to 02:00 p.m.
Applied Physics, Course Code- US03CAPH22
Course title- Digital electronics and optoelectronic devices

Maximum Marks: 70

Q-1 Write answers to the following multiple-choice questions in your answer book by selecting the proper   [10]
option.

(1) The Exclusive-OR gate law states that-
(A) $\overline{A} B + A \overline{B}$ (C) $A B + \overline{A} \overline{B}$
(B) $\overline{A} B + \overline{AB}$ (D) $A B + \overline{AB}$

(2) The 2's complement of the binary number 10101011 is-
(A) 01010101   (C) 10101000
(B) 01010100   (D) 11110000

(3) In the binary numbers the position of signed number is fixed at the
(A) Most significant bit   (C) Least significant bit
(B) both a and b   (D) Not fixed

(4) *The* logic expression $(A + B) (\overline{A} + \overline{B})$ can be implemented by giving the inputs A and B to a two-input
(A) NOR gate   (C) X-NOR gate
(B) NAND gate   (D) X-OR gate

(5) The number of cells in a 5 variable K-map is –
(A) 6   (C) 36
(B) 12   (D) 32

(6) Both the J-K and T flip flop are derived from:
(A) The basic SR latch   (C) both a and b
(B) The basic D latch   (D) None of these

(7) Which of the following logic circuits accepts two binary digits on inputs, and produces two binary digits, a sum bit and a carry bit on its outputs?
(A) Full-adder   (C) Serial adder
(B) half- adder   (D) parallel adder

(8) A binary to octal decoder is
(A) 3 line to 8 line decoder   (C) 4 line to 8 line decoder
(B) 1 line to 8 line decoder   (D) Any line to 8 line decoder

(9) A photo-diode is normally:
(A) Forward biased   (C) Reverse biased
(B) Neither forward nor biased   (D) Emitting light

(10) The power consumption of an LCD as compared to an LED is:
(A) Same   (C) Less
(B) More   (D) Can't be defined

Q-2 Fill in the blanks/ True- False (All questions are compulsory)   [08]
(1) In an LED emission of light is due to emission of electrons.   [True/ False]
(2) In a phototransistor, the base current is inversely proportional to the light. [True/ False]
(3) A byte is a group of 8 bit.   [True/ False]
(4) The octal code is used for the labelling of K-map.   [True/ False]
(5) In X-NOR gate, both the inputs are high then the output is ....
(6) An n variable K- map have … … … … … … … cells.
(7) ………….. gate is used in parity bit checker.
(8) For a Light Emitting Diode, ……………… Semiconductor material is used.

P.T.O.

(1)

Q-3 Short questions (Attempt any ten out of twelve) [20]

   (1) State the De Morgan's theorem.
   (2) What is the difference in between Flip Flop and latch?
   (3) Convert the $(1101.00010101)_2$ to decimal.
   (4) Brief note on laws of Boolean Algebra.
   (5) Find the binary equivalent of $(368)_{10}$.
   (6) Find the $(734)_8 = (?)_{16}$.
   (7) Sketch the half adder diagram.
   (8) Sketch the even parity bit checker diagram.
   (9) Why we need the semiconductor material for a specific band gap in case of LED?
  (10) What is the function of multiplexer?
  (11) Brief the optocoupler.
  (12) What are optoelectronic devices?

Q-4 Long Questions (Attempt any four out of eight, each question has equal marks.) [32]

   (1) Prove the Boolean expression of Exclusive OR and Exclusive NOR gate using truth table technique.
   (2) Solve the following numbers.
     (i) $(111011)_2 - (101101)_2$ (ii) $(ABCD)_{16} = (?)_8$ (iii) $(5867)_8 = (?)_2$ (iv) $(1357)_{10} = (?)_2$
   (3) Prove that
     (i) $\overline{ACB} + (\overline{A + B + C}) = \bar{A}\bar{B}\bar{C}$ (ii) $\overline{ABC + \bar{A}B + BC} = \bar{A}\bar{B}$
   (4) What is Flip Flop? Explain the J-K flip flop in detail with appropriate figure.
   (5) What is a parity bit checker? Explain the even and odd parity checker in detail with necessary figure.
   (6) Explain the Decoder in detail with an example.
   (7) What is a Photocell? Explain the Solar cell in detail.
   (8) Write a detail note on Light Emitting Diode's operation and construction and its application.

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