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SARDAR PATEL UNIVERSITY

S. Y. B.Sc. Examination, Semester III

Date & time: ~~January 4th~~ 2021 (Monday), 2:00 p.m. to 4:00 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 option. [10]

- (1) The number of cells in a 5 variable K-map is -
 (A) 6 (C) 36
 (B) 12 (D) 32
- (2) Both the JK 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
- (3) 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
- (4) 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
- (5) A photo-diode is normally:
 (A) Forward biased (C) Reverse biased
 (B) Neither forward nor biased (D) Emitting light
- (6) The power consumption of an LCD as compared to an LED is:
 (A) Same (C) Less
 (B) More (D) Can't be defined
- (7) The Exclusive-OR gate law states that-
 (A) $\bar{A}B + A\bar{B}$ (C) $AB + \bar{A}\bar{B}$
 (B) $\bar{A}B + \bar{A}\bar{B}$ (D) $AB + \bar{A}\bar{B}$
- (8) The 2's complement of the binary number 10101011 is-
 (A) 01010101 (C) 10101000
 (B) 01010100 (D) 11110000
- (9) 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
- (10) The logic expression $(A + B)(\bar{A} + \bar{B})$ 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

Q-2 Fill in the blanks/ True- False (All questions are compulsory)

[08]

- (1) The emission of light in a Light emitting diode is due to emission of electrons. [True/ False]
- (2) The base current is inversely proportional to the light in a phototransistor. [True/ False]
- (3) A nibble is a group of 8 bit. [True/ False]
- (4) The gray code is used for the labelling of K-map. [True/ False]
- (5) In Exclusive NOR gate, both the inputs are high then the output is
- (6) An n variable K- map have ... cells.
- (7) gate is used in even and odd parity bit checker.
- (8) For a LED, (material name) Semiconductor material is used.

[P.T.O.]

[1]

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

[20]

- (1) Give the statement of De Morgan's theorem.
- (2) Differ in between Flip Flop and latch?
- (3) Solve the $(1101.00010101)_2 = (?)_{10}$.
- (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) What is an optocoupler?
- (12) A short note on 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) $(5867)_8 = (?)_{10}$ (iv) $(1357)_{10} = (?)_2$
- (3) Prove that
(i) $\overline{ACB} + \overline{(A + B + C)} = \overline{A}\overline{B}\overline{C}$ (ii) $\overline{\overline{ABC} + \overline{AB} + BC} = \overline{A}\overline{B}$
- (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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