SARDAR PATEL UNIVERSITY
S.Y.B. Sc. Examination, Semester III
Date & day: 26-11-2019 & Tuesday
Time: 02:00 to 05:00 pm
Physics Course Code- US03CAPH22
Course Title-Digital Electronics & Optoelectronic Devices

Total Marks:70

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

(1) A group of 8 bit is known as-
   (a) A nibble   (b) a byte   (c) a bit   (d) an octal number

(2) In X-NOR gate, both the inputs are high then the output is-
   (a)High   (b) Low   (c) undefined   (d) both a and b

(3) The number of adjacent cells each cell in an n variables, a K- map can have is-
   (a) n-1   (b) n   (c) n+1   (d) 2n

(4) $(734)_8 = (?)_{16}$
   (a) C 1 D   (b) D C 1   (c) 1 C D   (d) 1 D C

(5) The device used to store the one bit data is known as-
   (a) Flip Flop   (b) Register (c) decoder   (d) Encoder

(6) How many flip-flops are required to produce a divide-by-128 device?
   (a) 1   (b) 4   (c) 6   (d) 7

(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   (b) half- adder   (c) Serial adder   (d) parallel adder

(8) The number of control lines for 16 to 1 multiplexer is
   (a) 2   (b) 4   (c) 3   (d) 5

(9) The combined package of LED and a photodiode is known as-
   (a)Opto-couplers   b) Opto-isolator   c) Optically coupled isolator   d) All of these

(10) A photodiode is used in reverse bias because-
   (a) Majority of electron-hole pairs swept are reversed across the junction
   (b) Only one side is illuminated
   (c) Reverse current is small compared to photocurrent
   (d) Reverse current is large compared to photocurrent

Q-2 Answer the following questions in brief. (Answer any Ten Questions) [20]

(1) Convert the $(1001011)_2$ to octal.

(2) Add the binary numbers 1101.101 and 111.011

(3) Draw the truth table of X-NOR gate.

(4) Write the Commutative and distributive laws of Boolean algebra.

(5) Show that - $AC + \bar{A}B = (A + B)(\bar{A} + C)$

(6) Sketch the three variable K-map and there expression.

(7) Sketch the full adder circuit diagram.

(8) Write few application of multiplexer.

(9) Why we need a parity bit checker?

(10) Compare the photo cell and Solar cell.

(11) What is an optocoupler?

(12) Sketch the LED seven segment display.

(P.T.O.)

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Q-3 (a) Prove the De Morgan's theorem using truth table method. **[6]**

(b) Compare the exclusive OR and Exclusive NOR gate. **[4]**

OR

Q-3 (a) Add the following numbers. **[6]**

(i) $(173)_{16}+(265)_{16}$ (ii) $(777)_8+(677)_8$ (iii) $(111011)_2+ (101101)_2$

(b) Convert $(B36.ABC)_{16}$ to decimal number. **[4]**

Q-4 (a) Reduce the expression- **[6]**

(i)$AB + A(B + C) + \bar{B}(B + D)]$ (ii) $(X+Y+Z)(\bar{X} + \bar{Y} + \bar{Z})$

(b) Explain the J-K flip flop in detail. **[4]**

OR

Q-4 (a) Prove that **[6]**

(i) $\overline{ACB} + \overline{(A + B + C)} = \bar{A}\bar{B}\bar{C}$ (ii) $\overline{ABC + \bar{A}\bar{B} + BC} = \bar{A}\bar{B}$

(b) Reduce the expression $f = \Sigma(2,3,6,7,8,10,11,13,14)$using K- map. **[4]**

Q-5 (a) What is parity bit checker? Draw the figure for even and odd parity checker. **[6]**

(b) Discuss the 4 bit adder and subtractor. **[4]**

OR

Q-5 (a) Explain the Encoder with an example of Octal to BCD encoder in detail. **[6]**

(b) Distinguish in between full adder and full-subtractor. **[4]**

Q-6 (a) Write a detail note on Light Emitting Diode's operation and construction and its application. **[6]**

(b) Sketch the typical construction and illumination characteristics for a photoconductive cell. Explain its operation. **[4]**

OR

Q-6 (a) Give a brief note on the Working, operation and characteristics of Laser diode. **[6]**

(b) Sketch characteristics for a phototransistor, and explain how the device operates. **[4]**

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