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SARDAR PATEL UNIVERSITY

B. Sc. 3rd SEMESTER EXAMINATION (CBCS) : NOVEMBER 2018

Subject: Applied Physics Title: Digital Electronics & Optoelectronic Devices Code: US03CAPH02

Date: 26-11-2018 Monday Time: 02:00 p.m. to 05:00 p.m. Total Marks: 70

Q.1 Answer the following MCQs with correct option (Each of One Mark). **(10)**

1. A decimal number 8 is, ... in binary.
   (a) 1010 (b) 1000 (c) 0100 (d) 1001.
2. A Hexadecimal number A is, ... in binary.
   (a) 1000 (b) 1010 (c) 0100 (d) 1001.
3. De Morgan's theorem states that $\overline{AB}$ = ...
   (a) $\bar{A} + \bar{B}$ (b) $\bar{A} \cdot \bar{B}$ (c) AB (d) $A+B$
4. Which of these is not one of OR laws?
   (a) A + A =1 (b) A + 1 =1 (c) A + 0 = A (d) A + A = A
5. To convert serial data to parallel data, ...is required.
   (a) counter (b) demultiplexer (c) flip flop (d) multiplexer
6. In parity checker ..... gate is used.
   (a) NAND (b) NOR (c) X-OR (d) X-NOR
7. The GaAs LED emits ..... radiation.
   (a) ultraviolet (b) visible (c) microwave (d) infrared
8. Normally a photo-diode is .....
   (a) reversed biased (b) forward biased (c) emits radiation (d) not biased.
9. A phototransistor and an LED together constitutes a package known as
   (a) opto-isolator (b) opto-coupler (c) amplifier (d) converter
10. A flip flop can be used for ....
    (a) modulator (b) scaling (c) counting (d) rectifer

Q-2 Answer any TEN questions in short (Each of two Mark) **(20)**

1. With proper example explain binary to decimal conversion.
2. Convert $(2598.675)_{10}$ to Hexadecimal.
3. Discuss various logic families.
4. Show that; $A\bar{B}C + B + B\bar{D} + AB\bar{D} + \bar{A}C = B + C$
5. Reduce the expression: $Y = (B + BC)(B + \bar{B}C)(B + D)$
6. Explain Commutative law for AND operation.
7. Draw logic diagram of a 4- bit binary parallel adder.
8. What is a half- subtractor? Draw its block diagram and truth table.
9. Explain importance of parity bit generators and chekers.
10. Discuss LED seven segment display.
11. Discuss application of photoconductive cells.
12. Explain principle of photodiode.

Q-3 (a) What is a logic gate? For a two input AND gate draw the logic symbol and explain truth table. Explain working of two input (i) diode and (ii) transistor AND gates with necessary diagram. **(06)**

(b) Explain NAND gate and its applications. **(04)**

OR

Q-3 (a) What is a logic gate? For a two input OR gate draw the logic symbol and explain truth table. Explain working of two input (i) diode and (ii) transistor OR gates with necessary diagram. **(06)**

(b) Explain exclusive OR (X-OR) gate and its applications. **(04)**

Q-4 (a) State and explain De Morgan's laws. **(06)**

(b) Explain associative laws for OR and AND operations **(04)**

OR

Q-4 (a) What is a latch? Explain basics of S-R latch and discuss active- high S-R latch. **(06)**

(b) State various applications of flip-flops and discuss any two of them. **(04)**

Q-5 (a) Define half-adder and full adder. For a half-adder, draw block diagram, logic diagram and explain its truth table. Draw a half-adder using 2-nput NAND gates. **(06)**

(b) With necessary logic diagram explain 4-bit binary adder-substractor **(04)**

OR

Q-5 (a) With suitable example, explain working of encoder. Explain decimal to BCD encoder with necessary diagram. **(06)**

(b) Explain what is a multiplexer and discuss basic 2-input multiplexer. **(04)**

Q-6 (a) Explain operational principle and construction of a LED with proper diagrams. State typical LED parameters. **(06)**

(b) What is a photoconductive cell? Explain its construction. **(04)**

OR

Q-6 (a) Explain operational principle and construction of a laser diode with necessary diagram. Discuss its characteristics and state its typical parameters. **(6)**

Q-6 (b) What is a solar cell? Explain typical solar cell characteristics. **(4)**