Duration :- 2.30 Hrs | X119NDE19 | Maximum Marks : 75

Note : 1) All Questions are compulsory.
2) Figures to right indicate full marks.

Q.1. Attempt any three of the following. 15 M

(a) Explain digital signal. Also write it's applications.
(b) Perform
i. $(653)_8 - (177)_8$ ii. $(72)_{16} \times (39)_{16}$
(c) Write a short note on Error Correcting Codes.
(d) Perform the following binary operation.
i. $(101.11)_2 \times (111.01)_2$ ii. $(110\ 110)_2 \div (101)_2$
(e) Subtract using 2's complement $(11011011)_2$ from $(0101010)_2$
(f) Explain Gray code with it's advantages.

Q.2. Attempt any three of the following: 15

(a) Explain basic gates with it's symbol and truth table.
(b) Write a short notes on OR gate and AND gate.
(c) Prove the following using Boolean laws.
i. $(AB + C) . (AB + D) = AB + CD$
ii. $(x + xy) (x + \bar{x}y) (x + z) = x$
(d) Simplify using k-map and realize it using minimum number of gates.
$y = \Sigma m (1, 3, 7, 11, 15) + d (0, 2, 5)$
(e) Explain NAND gate and NOR gate with it's symbol and truth table.
(f) State and prove De-Morgan's theorem and realize it using basic gates.

Q.3. Attempt any three of the following 15

(a) Describe half subtractor with help of circuit diagram and truth table.
(b) Write a short note on fast multiplier.
(c) What is comparator circuit? Also explain it's working.
(d) Draw circuit and explain working of XS-3 adder.
(e) Design BCD to 7 segment decoder. Realize the circuit using NAND gates only.
(f) Explain and implement Binary to Gray Code convertor circuit.

Q.4. Attempt any three of the following. 15

(a) Explain clocked S-R flip – flop using four NAND gates.
(b) Discuss different applications of flip-flops.
(c) Explain with diagram the working of 1 : 8 demultiplexer.
(d) Write a short note on Multiplexer.
(e) Implement full adder circuit using 4 :1 mux.
(f) How S-R flip flop can be used to work as T flip-flop? Explain it.

Q.5. Attempt any three of the following. 15

(a) Write the difference between serial shifting and parallel shifting of data in shift register.
(b) Design a synchronous decade counter using D flip-flop.
(c) Write a short note on buffer register.
(d) Explain working of ripple counter.
(e) Write a short note on Johnson Counter.
(f) Write truth table for mod 6 counter in IC 7492.

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