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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec. - 2014

Digital Electronics

Time: 3 hrs *Max. Marks: 100*

Note: *i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.

Unit - I

1 a. Examine whether the following expressions are equivalent using truth table. 8

i) $f_1 = \left(\overline{a+b}\right)\left(\overline{\bar{a}+\bar{b}}\right)$, $f_2 = \bar{a}\bar{b}(ab)$ ii) $g_1 = a + \bar{a}\,b$, $g_2 = a+b$

b. Complement the following Given Boolean expression: 6

i) $f = \bar{b}\left(\bar{a}\bar{c} + bc\bar{d}\right)$ ii) $f = a\,\bar{c}\left(\overline{a\,\bar{c}} + b\bar{d}\right)$

c. Prove the following identities 6

i) $(a+b)\left(\bar{a}\bar{c}+c\right)\left(\overline{\bar{b}+ac}\right) = \bar{a}b$ ii) $a\bar{b}+b\bar{c}+\bar{a}c = \bar{a}b+\bar{b}c+a\bar{c}$

2 a. State and prove distributive law and absorption law using relevant truth table. 6

b. Implement the basic gates using universal gates. 10

c. Write the expression in algebraic form for the functions : 4

i) $f(w,x,y,z) = \sum m(4,8,10,14)$ ii) $f(a,b,c) = \pi M(0,3,5)$

Unit - II

3 a. Find the minimal sums for the following Boolean functions: 10

i) $f(a,b,c) = \sum m(1,3,4,5,6,7)$ ii) $f(a,b,c) = \pi M(2,4,7))$

b. Find all the prime implicants of the function $f(a,b,c,d) = \sum m(0,2,3,4,8,10,12,13,14)$ using Quine-Mcdusky method. 10

4 a. Realize the full subtractor in terms of its truth table expression for borrow and difference and implement it. 6

b. Design a carry look ahead adder for 4 stage adder and write the logic circuit. 8

c. What is full adder? Realize full adder using NAND gate only 6

Unit - III

5 a. Implement the following functions using 3 to 8 decoder with NAND outputs: 5

$f_1(a,b,c) = \sum m(1,3,5,6)$

$f_2(a,b,c) = \sum m(0,3,5,6)$

	b.	Give the comparison between multiplexer and de-multiplexer.	3
	c.	Explain the working of gated SR latch and gated D-Latch.	12
6	a.	Implement the following function using a 4:1 MUX with a & b as select lines $f(a,b,c,d) = \sum m(0,1,5,6,7,9,10,15)$	7
	b.	Give the comparison between encoder and decoder.	3
	c.	Explain the working of Master slave JK flip-flop with logic diagram.	10

Unit - IV

7	a.	Explain Mealy and Moore models of a clocked synchronous sequential network.	10
	b.	With neat logic diagram, explain the working of a 4 bit PISO register.	10
8	a.	Distinguish: i) Synchronous and Asynchronous counter ii) Ripple counter and Ring counter	4
	b.	Design a mod-4 counter (Synchronous type) using JK flip-flop. Implement the logic and give the table for R output of the counter.	10
	c.	With the help of logic diagram and state diagram explain the operation of Johnson counter.	6

Unit - V

9	a.	List the various characteristics of A/D convertor and D/A convertor	10
	b.	Explain the operation of a 4 bit R-2R type DAC and derive the expression for the output voltage.	10
10	a.	Explain the operation of flash A/D converter.	6
	b.	Draw the circuit diagram and explain the operation of 2 input TTL NAND gate with Totem-pole output.	8
	c.	Draw and explain the basic CMOS inverter circuits.	6

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