Reg. No.										

MANIPAL UNIVERSITY
SCHOOL OF INFORMATION SCIENCES

SECOND SEMESTER MASTER OF ENGINEERING – **ME** (VLSI DESIGN)
DEGREE EXAMINATION – APRIL / MAY 2016

SUBJECT: EDA 616.11 (ELECTIVE 2) – ADVANCED LOGIC SYNTHESIS

Friday, May 6, 2016

Time: 10.00 – 13.00 Hrs. Max. Marks: 100

1. A. Define synthesis and name at least 4 optimization criteria for synthesis.
   B. Write synthesizable Verilog code for a 4- bit shift register

   (5x2=10 marks)

2. Give the general formula for Shannon expansion and expand the following by taking A as splitting variable.
   A. F = AB+AC+BC
   B. F = A'C+BC'+A'B'C+AB'C'

   (5x2=10 marks)

3. Using Quine-McClusky method find the minimal SOP expressions of
   $F(w,x,y,z) = \sum 0,1,2,3,4,5,6,8,11,12,14$

   (10 marks)

4. Simplify the following by applying the consensus theorem.
   A. wxy+wx'z+wyz;
   B. vw'y+vyz+wyz
   C. ab'c + bc'd + ad
   D. abc'd + c'd'e + abc'e
   E. abc+c'd+a'b

   (2x5=10 marks)

5. Find minimum for following two-level multiple-output for the function and mention the reduction in number of Inputs & Gates
   $F1(A,B,C,D) = \Sigma m\ (3,4,6,9,11)$,
   $F2(A,B,C,D) = \Sigma m\ (2,4,8,10,11,12)$,
   $F3(A,B,C,D) = \Sigma m\ (3,6,7,10,11)$

   (10 marks)

6. Explain the simplified design flow for FSM and draw a Moore machine for detecting an overlapped input sequence 10101.

   (10 marks)

7. Find the equivalence partition by iterated collapsed approach and a corresponding reduced machine for the following sequential machine:

PS	x = 0	x = 1
1	2, 0	5, 0
2	5, 0	4, 0
3	4, 1	1, 0
4	3, 1	5, 0
5	2, 0	4, 0

(10 marks)

8. Find the prime compatibles of the incompletely specified FSM shown below

PS	NS, Output	
	I1	I2
A	F,0	C,-
B	-,-	F,1
C	E,0	B,-
D	A,1	D,0
E	C,-	D,1
F	A,0	A,-

(10 marks)

9. Solve the following Binate covering problem using reduction techniques

$F = (x1 + x2 + x4)\ (x4')(x2+x6)(x1 + x3 + x5 + x6)(x6' + x2 + x4)(x5' + x4 + x1)$

(10 marks)

10. Consider the logic network defined by following expressions:

x=ad'+a'b'+a'd'+bc+bd'+ac
y=a+b
z=a'c'+a'd'+b'c'+b'd'+e
u=a'c+a'd+b'd+e'

A. Draw the logic network graph.
B. Perform the algebraic division f_x/f_y and show all steps.
C. Substitute y into f_x and redraw the network graph.
D. Compute all kernels and co-kernels of z and u.
E. Extract a multiple-cube sub-expression common to f_z and f_u. Show all steps. Redraw the network graph.

(2x5=10 marks)

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