USN | | | | | | | | | | |

14ELD252

Second Semester M.Tech. Degree Examination, June/July 2016
Synthesis and Optimization of Digital Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain the different microelectronic design styles. **(08 Marks)**

b. Explain surjective, injective and bijective functions. **(06 Marks)**

c. Define (i) Polar dag (ii) Acyclic graph (iii) Cutset (iv) Complete graph (v) Indegree & Outdegree. **(06 Marks)**

2 a. Find the shortest path for the graph shown in Fig. Q2 (a) using Bellman-Ford algorithm. **(10 Marks)**

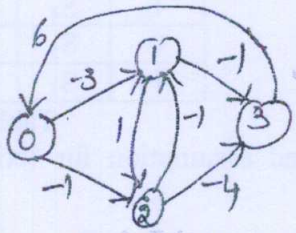

Fig. Q2 (a)

b. For the function, $f = ab + bc + ac$, compute the expansion on the orthonormal basis. Given that $\phi_1 = a$, $\phi_2 = a'b$ and $\phi_3 = a'b'$. Consider the lower bound of f_{ϕ_i} in each case. **(10 Marks)**

3 a. Consider the following equations:

$x_1 = x + dx;$

$U_1 = [U - (3 * x * u * dx) - (3 * y * dx)];$

$y_1 = (y + u * dx);$

$c = x_1 < a;$

$x = x_1;\ u = u_1,\ y = y_1$

Implement in VHDL using behavior style. The input and output port signals are of integer and the range is from 0 to 255. **(10 Marks)**

b. Explain tree height reduction, constant propagation, dead code elimination, operator strength reduction and loop expansion. **(10 Marks)**

4 a. For the function $f(a,b,c) = a'c' + a'b + bc + ac$ and $f_2(a,b,c) = bc$, obtain the cover of the function, minimum cover and irredundant cover. Represent the same in Boolean cube. **(10 Marks)**

b. Represent the function, $f = ab + ac + ab'c' + a'$ in positional cube rotation and check the function is tautology or not. **(10 Marks)**

5 a. Find the expanded cover of the function $f = a'b'c' + ab'c' + a'bc' + a'b'c$ with abc' as a don't care condition. **(08 Marks)**

b. Draw the logic network after elimination and decomposition described with primary input variables {a, b, c, d, e} and primary output variables {w, x, y, z} by the combinational equations:

$p = ce + de;\ q = a + b;\ r = p + a';\ s = r + b';\ t = ac + ad + bc + bd + e;\ u = q'c + qc' + qc,$

$v = a'd + bd + c'd + ae',\ w = v,\ x = s,\ y = t,\ z = u.$ **(12 Marks)**

6 a. Find the kernel set of $f = ace + bce + de + g$. Also find its co-kernel. **(10 Marks)**

b. For the expression, $f = ace + bce + de + g$, write the corresponding matrix representation. Also find the rectangles and its co-rectangles. **(10 Marks)**

7 a. Explain the state encoding for two level circuits using the state table given in table Q7 (a). **(10 Marks)**

Input	State	Next state	Output
0	S_1	S_3	0
1	S_1	S_3	0
0	S_2	S_3	0
1	S_2	S_1	1
0	S_3	S_5	0
1	S_3	S_4	1
0	S_4	S_2	1
1	S_4	S_3	0
0	S_5	S_2	1
1	S_5	S_5	0

Table Q7 (a)

b. Explain modeling and assumption for retiming in sequential circuit optimization using network models. **(10 Marks)**

8 a. Explain integer linear programming model of scheduling with resource constraints. **(10 Marks)**

b. Briefly explain rule based library binding. **(10 Marks)**

* * * * *