Digital Electronics

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

12EC077

M.Tech. Degree Examination, June/July 2013

Synthesis and Optimization of Digital Circuits

Time: 3 hrs. Max. Marks:100

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

1 a. Draw the Y chart for different level of abstraction and synthesis. Explain different levels briefly. **(10 Marks)**

b. Explain the different phases in the design of micro-electronic circuits. Give the block representation. **(10 Marks)**

2 a. Define the following terms with respect to concept of graph theory and give an example for each:
i) Undirected graph
ii) Directed graph
iii) Hyper graph **(06 Marks)**

b. Compute the shortest path weight of the graph shown in Fig.Q2(b): **(08 Marks)**

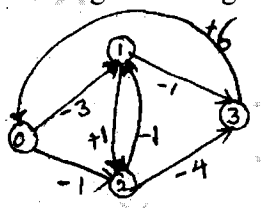

Fig.Q2(b)

c. Consider the function f = ab + bc + ac. Compute the Boolean difference, the consensus and smoothing with respect to the variable a. Also indicate them in the cubical form. **(06 Marks)**

3 a. Consider the following model fragment,
$x\ell = x + dx$; $u\ell = u - (3 * x * u * dx) - (3 * y * dx)$; $y\ell = y + u * dx$; $c = x\ell < a$;
Draw: i) Data flow graph, ii) Sequencing graph. **(10 Marks)**

b. Briefly explain control flow based transformation and block level transformation. **(10 Marks)**

4 a. Consider the three input, two output function $f_1 = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}c + a\bar{b}c + abc + ab\bar{c}$; $f_2 = \bar{a}bc + a\bar{b}c$; Find minimum cover, irredundant cover and minimal cover, with respect to single implicant containment. Represent it using three dimensional Boolean cube. **(10 Marks)**

b. For the constraint matrix given below, obtain (i) compatibility graph, (ii) conflict graph.

$$A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$ **(10 Marks)**

5 a. Draw the logic network and logic network after elimination described by the following equation:
$p = c\ell + de$; $q = a + b$; $r = p + \bar{a}$, $s = r + \bar{b}$; $t = ac + ad + bc + bd + e$; $u = \bar{q}c + q\bar{c} + qc$;
$v = \bar{a}d + bd + \bar{c}d + a\bar{e}$; $w = v$; $x = s$; $y = t$; $z = u$. **(10 Marks)**

b. Explain briefly rule based systems for logic optimization. **(10 Marks)**

6 a. For the state diagram shown in Fig.Q6(a), find minimum static diagram.

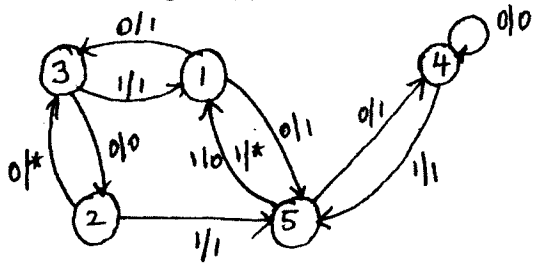

Fig.Q6(a) **(10 Marks)**

b. Explain different types of finite state machine decompositions. **(10 Marks)**

7 a. With suitable example, explain relative scheduling under timing constraints. **(10 Marks)**

b. What is the need of loop folding? With suitable sequencing graph, explain loop folding. **(10 Marks)**

8 a. Explain briefly tree based matching. **(08 Marks)**

b. For the module function $m = s_1(s_2a + \bar{s}_2b) + \bar{s}$, $(s_3c + \bar{s}_3d)$ and cluster function $f = xy + \bar{x}z$. Draw programmable module, module and cluster ROBDD and representation of cluster function. **(12 Marks)**

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