040

The Open University of Sri Lanka
Department of Electrical and Computer Engineering
Final Examination 2005/2006
ECD2211 – Switching Systems

Time: 1330 – 1630 hrs. Date: 2006-03-25

Answer any FIVE questions

1.

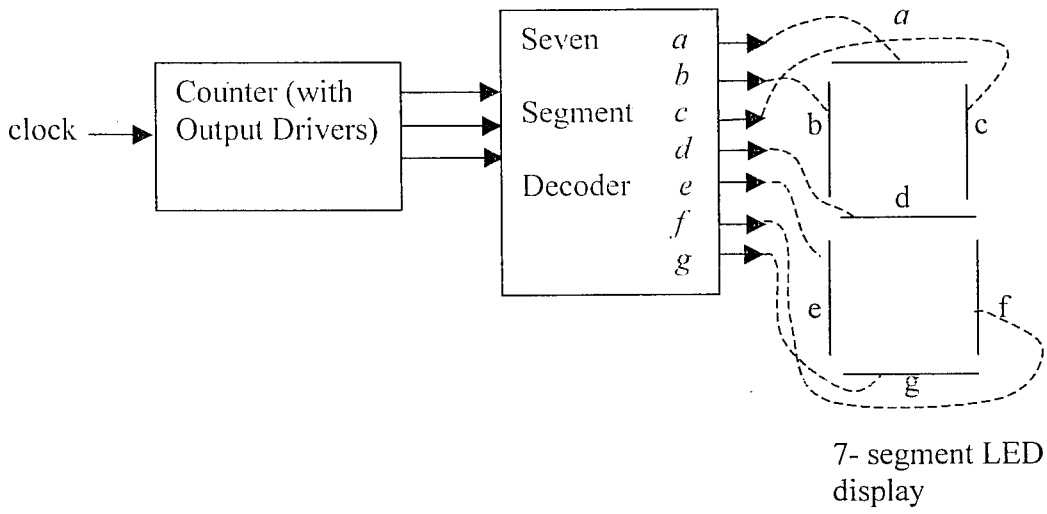

Fig.1

Fig.1 shows a circuit consisting of a binary counter, a decoder and a 7-segment LED display. The counter output is fed to *a binary to seven-segment decoder* circuit which decodes the binary number into corresponding 7-segments. The outputs *a*, *b*, *c*, *d*, *e*, *f* and *g* of the 7-segment decoder are connected to the corresponding segments of the 7-sement display.

(a) What is the maximum possible count of the counter?
(b) Design *a binary to seven segment decoder* circuit.

2.
Simplify the following functions using Quine McClusky method.

(a) $f(x) = \Sigma m\ (0, 1, 2, 3, 4, 5, 6, 7)$

(b) $f(x) = \Sigma m\ (6, 7, 12, 13, 14, 15)$

(c) $f(x) = \Sigma m\ (0, 5, 10, 15)$

3.

(a) What is understood by Consensus of two terms minterms t_1 and t_2?

(b) Simplify the following functions using *Iterative Concensus method.*

(i) $f(x) = \Sigma m\ (0, 2, 8, 10)$

(ii) $f(x) = \Sigma m\ (0, 1, 4, 5)$

(iii) $f(x) = \Sigma m\ (2, 8, 13)$

(c) Compare the advantages and disadvantages of using Karnaugh map over Quine Mc Clusky method.

4.

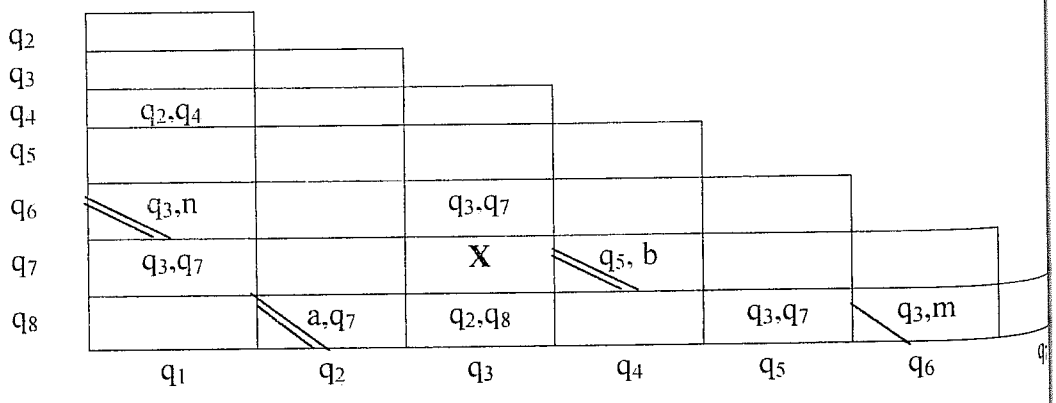

Fig 4

An Implication table is shown in Fig.4.

(a) Find the values of a, b, m and n
(b) Determine maximal compatibles.

5.

(a) Describe the construction of a 2-input Threshold gate circuit which uses only passive components. Give the circuit diagram of it.

(b) Implement using minimum number of Threshold logic gates:

(i) $f(x) = \Sigma m\ (4, 5, 7, 13)$

(ii) $f(x) = \Sigma m\ (2, 6, 14, 15)$

(iii) $f(x) = \Sigma m\ (6, 7, 13, 14, 15)$

6.

(a) What are the factors that affect the highest operating frequency of a logic gate?

(b) What value should the *row mulpliciy / column mulplicity* of a Partition map of f(x) take so that the Partition map can be converted into a reduced Partition map?

(c) Check whether the following functions are totally symmetric:

(i) $f(x) = \Sigma m\ (0, 1, 2, 4, 8, 15)$

(ii) $f(x) = \Sigma m\ (1, 3, 4, 6, 8, 15)$

7.

(a) What is understood by 2-distinguishable state?

(b)

Present state (y_1 y_2)	Next State (Y_1, Y_2) for Input (x)	
	x = 0	x = 1
q_1 =00	00	11
q_2 = 01	11	00
q_3 = 11	10	11
q_4 = 10	11	00

Fig.7

Fig.7 shows a *state transition table* for a certain state machine.

Design the state machine using RS flip-flops.

8.

A continuous binary serial bit stream is fed to *a data logger*. The data logger searches for *four* consecutive '1's in the bit stream. If it detects *four* consecutive '1's then the device gives out an alarm.

(i) Draw a state diagram for the above process. How many states are there in the state machine?

(ii) How do you assign binary numbers to different states? What criterion should be adopted when assigning numbers to adjacent states?

(iii) Draw a *state transition table* for the state machine.