## EE1005 – Digital Logic Design Quiz# 3

## **SOLUTION MANUAL**

**Q**: An **M-bit** thermometer code for the number **k** consists of (**k**) 1's in the least significant bit positions and (**M – k**) 0's in more significant bit positions. A binary-to-thermometer code converter has **N** inputs and  $2^N - 1$  outputs. It produces a  $2^N - 1$  bit thermometer code for the number specified by the input. Design a combinational circuit for binary-to-thermometer code converter provided the number of inputs = 3 by finding the following:

## **Marking Criteria:**

Inputs/Outputs: 1 mark Truth Table: 5 marks Equations: 4 marks

Circuit Diagram: 5 marks

Note: Incase truth table is wrong, question will receive 0 marks. (Binary Checking)

Those who tried to attempt it a little and got 1-2 values wrong, they may receive partial marks for the truth

table.



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No of Inputs: 3 No of Outputs:  $2^3 - 1 = 7$ (1 marks)

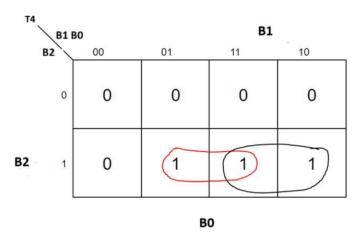
(5 marks) **Truth Table:** 

From the definition above, we can fill the truth table. 0 will have zero 1s, 1 will have one 1s starting from the least significant bit, 2 will have two 1s and so on and so on.

Decimal Digit	Inputs			Outputs						
	B2	B1	В0	T6	T5	T4	Т3	T2	T1	T0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0	0	1
2	0	1	0	0	0	0	0	0	1	1
3	0	1	1	0	0	0	0	1	1	1
4	1	0	0	0	0	0	1	1	1	1
5	1	0	1	0	0	1	1	1	1	1
6	1	1	0	0	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1

**Equations:** (1.75 each = 4 marks)

Using k-maps to obtain the following equations, one is done rest was similar too.



From k map: T4 = B2.B0 + B2.B1 Similarly, **T6** = B2.B1.B0

**T5** = B2.B1

 $T_5 = 1$ , iff  $B_2 = 1$ ,  $B_1 = 1$ 

T<sub>3</sub> only depends on B<sub>2</sub>

**T3** = B2

**T2** = B2 + B1.B0

**T1** = B2 + B1

**T0** = B2 + B1 + B0

<u>Circuit Diagram:</u> (5 marks)

