PART B [15 MARKS]

Instruction: Answer all questions. You must show all necessary working clearly.

1. Convert the logic circuit in Figure 1 to logic circuit using 2-input NOR universal gates only. [2.5 marks]

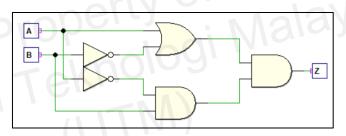


Figure 1

2. Convert the logic circuit in Figure 2 to logic circuit using basic gates (AND, OR, NOT) only. [5 marks]

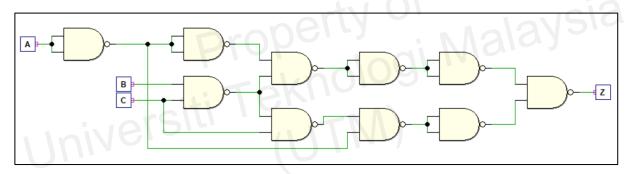


Figure 2

3. Simplify expression F using Boolean Algebra rules. [2.5 marks]

$$F = (A+B)\,\bar{B} + (A+B)(\bar{A}+\bar{B})$$

4. Simplify expression X using De Morgan theorem and Boolean Algebra rules. [5 marks]

$$X = \overline{(B\bar{C} + C) + (B + \bar{B}E + D)}$$

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PART C [20 MARKS]

Instruction: Answer all questions. You must show all necessary working clearly.

Figure 1 shows a schematic diagram of an LED array light. You are required to design a combinational logic circuit to be embedded into the Circuit Box.



Figure 1

The Circuit Box receives a BCD sequence from a BCD counter as its input, and then lit the LED array according to Table 1.

Table 1				
Decimal	LED 3	LED 2	LED 1	
0				
1			4	
2		111) V	1-11612
3		Ly		Nalaysia
4			M is	1010.
5	1 - 10	$\gamma(\cdot)/r$	A* "	
6	KIV			
7		_ 11		
8				
9	\) \	4 4 1		
Legend:				
Active High LED is OFF				

You are required to:

1. Produce the truth table that defines the function of the Circuit Box. [9m]

Active High LED is lit

- 2. Derive the simplified SOP Boolean equation of LED1, LED2 and LED3 using K-Map. [6m]
- 3. Sketch the combinational logic circuit of the Circuit Box using basic gates only. [5m]