Question 2

a. Authorities of a university havw decided to measure body temperature of all students who enter to the university premises for examinations during this COVID-19 pandemic situation. Measurements are taken as follows.

- T1 – The first measurement of body temperature at the entrance.
- T2 – The second measurement is taken after 5 minutes **if only** T1 reports high temperature. A student who reports both T1 and T2 high, will not be allowed to enter the premises.
- T3 – The third measurement is taken during the examination.
- T4 – The fourth measurement is taken when a student is leaving the exam venue.

Based on the following rules, the medical officer will be alerted (X) on a student's temperature readings.
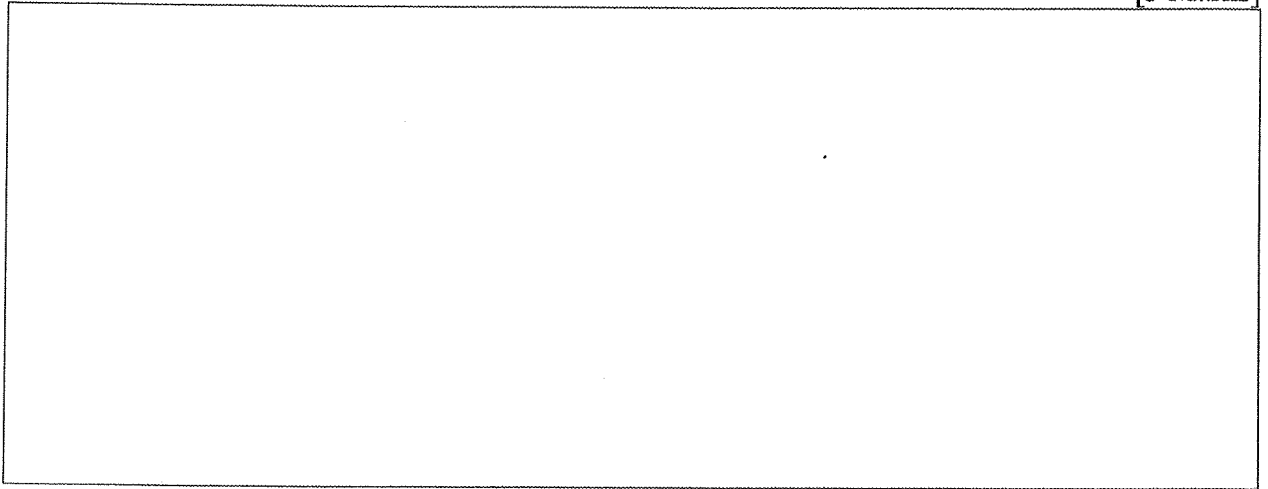
- T1 and T2 both report high temperatures.
- T3 reports high temperature while T1 or T2 has reported high.
- T4 reports high temperature while T3 has reported high.

i. By assuming high temperature of a measurement as Boolean value 1 and 0 otherwise, complete the following truth table for Boolean function X of *alerting the medical officer*. X is 1 when the *medical officer* is alerted and 0 otherwise.

[8 Marks]

T1	T2	T3	T4	X
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

ii. Identify all the cases where output is not defined (*don't care conditions*) in the above truth table and list all the don't care conditions in standard product form (*minterms*). State your reasons for the identification of don't care conditions.

[3 Marks]

iii. Derive the **most simplified** Boolean expression in **Standard Sum of Products form** for the above truth table using **Karnaugh Map**. Clearly show don't care conditions and your grouping.

[5 Marks]

6