Test 2 20/21-1

Tuesday, 19 December 2023 1:32 PM

Test 2 Part B
20202021-1

UTM UNIVERSITI TEKNOLOGI MALAYSIA
RESEARCH UNIVERSITY
School of Computing

TEST 2 (PART B) SEMESTER I 2020/2021

COURSE CODE	:	**SECR1013**
COURSE TITLE	:	**DIGITAL LOGIC**
PROGRAM	:	**SEC(R/J/B/V/P)H**
DATE	:	**9 JANUARY 2021**

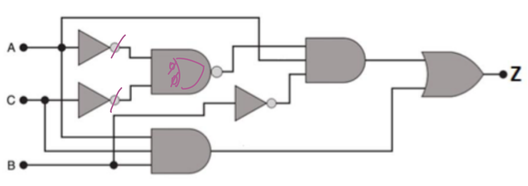
INSTRUCTIONS:

1. **You must answer PART B with BLUE or BLACK ink pen/pencil handwritten on a piece of paper.**
2. **You are strictly prohibited to use any kinds of software to assist you. However, the use of calculator is permitted.**
3. **Make sure YOUR FULL NAME and YOUR SECTION is on every answer sheet. Use FULL_NAME_MATRIC_NO_SECTION for FILENAME format.**
4. **Each answer must be clearly NUMBERED in the answer sheet. Start each question in a new page.**
5. **Only pdf, jpg or word doc is permitted to be uploaded to UTM e-learning.**
6. **You must stop answering at the end of 50 minutes and finish uploading answers during the extra 15 minutes.**
7. **Please upload your answers to UTM e-Learning before the end of Test 2 time.**

Warning!
Students who are caught cheating during the examination will be reported to the disciplinary board for possible suspension of the student for one or two semesters.

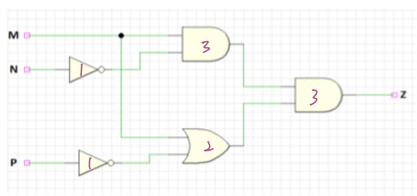
This question booklet consists of 2 pages excluding the front page.

QUESTION 1 (5 MARKS)



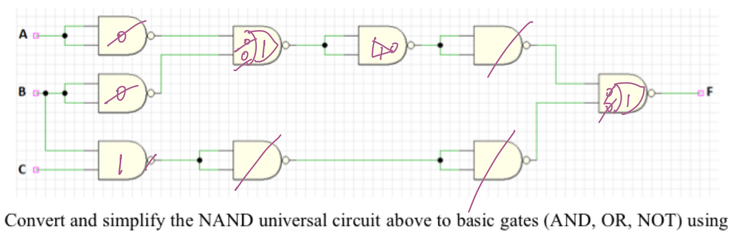
Based on logic circuit shown above, simplify Boolean expression Z using Boolean Algebra simplification. Show all your workings.

QUESTION 2 (4 MARKS)



Convert the logic circuit above to 2-input NOR universal gate only. Show all your workings

QUESTION 3 (3 MARKS)



Convert and simplify the NAND universal circuit above to basic gates (AND, OR, NOT) using dual symbol. Show all your workings.

QUESTION 4 (18 MARKS)

Referring to the announcement made by the Ministry of Health on 29 October 2020 which had listed Johor Bahru as the red zone (dangerous) for COVID-19, the University management has decided that all services except those declared as essential services, have to be performed from home, i.e., Work From Home (WFH). output

The following are the rules applied to determine which staffs are allowed to WFH.

(1) UTM campus is close and staffs live in red zone. A=1 C=1
(2) UTM campus is close and staffs are non-essential workers. A=1 B=0
(3) UTM campus is open and staffs are non-essential workers with active COVID-19 cases in their neighbourhood. A=0 B=0 D=1

Hints & Notes:

(1) There are 4 input variables.
(2) Red zone districts with zero COVID-19 cases does not exist. C=1 D=0 ×
(3) Red zone: dangerous districts with 40 or more cases of COVID-19.
(4) Green zone: district with less than 40 cases of COVID-19.

Design a combinational logic circuit with the least number of gates that will produce the desired output. All steps must be shown clearly. Please make sure all variables are defined, labelled and explained. If there is a need, you may state your (logical) assumption.

output - WFH

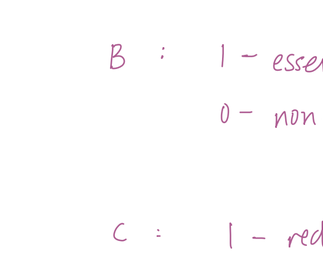
input : A : 1 - close
0 - open

B : 1 - essential
0 - non-essential

C : 1 - red zone
0 - green zone

D : 1 - active
0 - non-active

A	B	C	D	X	(1)	(2)	(3)
0	0	0	0				
0	0	0	1				1
0	0	1	0	X			
0	0	1	1				1
0	1	0	0				
0	1	0	1				
0	1	1	0	X			
0	1	1	1				
1	0	0	0			1	
1	0	0	1			1	
1	0	1	0	X			
1	0	1	1		1	1	
1	1	0	0				
1	1	0	1				
1	1	1	0	X			
1	1	1	1		1		



output = $A\bar{B} + AC + \bar{B}D$