Telkom University	**Mid-Term Test** **Odd Semester 2017/2018** **Boolean Algebra and Logical Circuit – FEH2H3** **Friday, 13 October 2017, 07.30 – 09.30 (120 minutes)** **Team Teaching: RTP, DHA, EJA, MHO, RIW, VST, ESM, INW, NYB**

= CLOSE ALL, calculator is allowed, turn off the mobile phone =
= No cheating. Cheating will be considered to be a violation of university policy =

Do the test on these sheets. Additional sheet is not available.
For calculation, use the empty space based on the corresponding number and don't move to other sheet.

Name:	**Student ID Number:**	**Class:**	**Room:**	**Score:**
……	……	……	……	

Copy this statement:	**Signature:**
I completed this test honestly and by my self. If I cheat, I will accept the concequencies.	
…… …… ……	……

No	PROGRAM LEARNING OUTCOME (PLO)
1	Believe in the absoluteness of God and show a religious attitude
2	Has the ability to apply basic knowledge of mathematics, science, and engineering
3	Has the ability to design a system, component, or process to meet the expected needs set within a realistic scope, including broadband content transmission using engineering methods in the field of telecommunications
4	Has the ability to design and conduct experiments including analyzing and interpreting data using scientific methods
5	Has the ability to identify, formulate, and solve the telecommunication engineering problems
6	Has the ability to operate hardware and utilize software applications, as well as programming skills that relate to information technology and telecommunications
7	Has the ability to communicate effectively, both oral and written communication
8	Has the ability to plan, execute, and evaluate assigned tasks according to the requirements
9	Has the ability to function on multidisciplinary and cross-cultural teams
10	Has the ability to be responsible according to the professional ethics
11	Has the ability to recognize the need for life-long learning including current issues in telecommunication and entrepreneurial knowledge

COURSE LEARNING OUTCOME (CLO)		PROGRAM LEARNING OUTCOME (PLO)										
		1	2	3	4	5	6	7	8	9	10	11
CLO 1	Students understand binary system, and use Boolean Algebra and K-Map to simplify function		X									
CLO 2	Students able to analyze and design logical circuit, combinational and sequential			X								
CLO 3	Students able to use software tool to design logical circuit						X					

CLO 1: Students understand binary system, and use Boolean Algebra and K-Map to simplify function

PLO 2: Has the ability to apply basic knowledge of mathematics, science, and engineering

A. Sets and Boolean Algebra

1. Prove that below equations are true by using Boolean Algebra and also draw its Venn Diagram:
   a. $x + x \cdot y = x$
   b. $\overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + A\overline{B}\overline{C} + AB\overline{C} = \overline{A}\overline{B} + A\overline{C}$

Answer:

2. Use Boolean Algebra to simplify these function:
   a. $F = \overline{A}\overline{B}C + AC + BC$
   b. $\overline{\bar{A}.B + \overline{A.\bar{B}} + A.B}$

Answer:

3. Using truth table below:
   a. What is the function for G? (please use SOP)
   b. What is the function for H? (please use POS)
   c. Simplify function G using Boolean Algebra

INPUT			OUTPUT	
S	**D**	**R**	**G**	**H**
0	0	0	**1**	**1**
0	0	1	**0**	**1**
0	1	0	**1**	**0**
0	1	1	**0**	**1**
1	0	0	**0**	**0**
1	0	1	**1**	**0**
1	1	0	**1**	**1**
1	1	1	**0**	**0**

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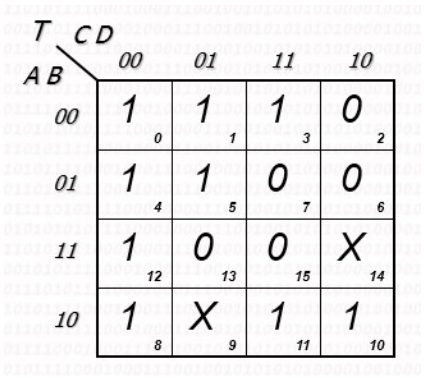
B. K-Map

1. Identify the group and function from K-Map below (x = don't care)

CD / AB	00	01	11	10
00	0	1	1	0
01	0	1	0	0
11	x	x	1	0
10	0	x	1	0

F (A,B,C,D) =



T (A,B,C,D) =

2. Draw its K-Map and simplify:

$$T = (\overline{C + D}) + \overline{A}\,C\,\overline{D} + A\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,C\,D + AC\overline{D}$$

3. Function P has 4 (four) inputs a, b, c, and d:
   P(a,b,c,d) = Σm (1,3,5,,7,9) + d(4,11,12,12,13,14,15).
   a. Draw its K-map
   b. Using K-map, identify function P in its simplest form
   c. Draw its logical circuit (using simplest form of function P) using logical gates

Answer:

CLO 1: Students understand binary system, and use Boolean Algebra and K-Map to simplify function

PLO 2: Has the ability to apply basic knowledge of mathematics, science, and engineering

Numerical System

1. Complete below tabel:

No	Decimal	Binary	Octal	Hexadecimal
1				7CE
2			167,4	

2. Complete below tabel:

No	Data	Decimal value if Data is in:		
		Binary	1's complement	2's complement
1	01110011			
2	11101010			

3. Transformation and Arithmetic

B6,2 (H) — (H)

73,5 (O) —

614,4 (O) + (O)

529,5 (d) +

4. Please do below calculation if it is in ***BCD (Binary Coded Desimal)***:

0111 1000

0110 0011 +

.....

5. Please do below calculation using 1's complement and explain how to read the result

$13_{(10)}$ - $14_{(10)}$ = ... + ... = ...