# Cse 231 (Digital Logic Design)

# Group Project: EID – 2021

Group members :

1. Mosroor Mofiz Arman (1921079642) – [SOP]
2. Md Ariful Hasan Suvo (1913087626) - [NAND]
3. Raiyan Rafsan (1921244042) - [NOR]
4. Latifa Hamid Munni (1921099042) - [POS]

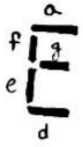
Submitted to:

Dr Mohammad Monirujjaman Khan (KMM)

Date: 27.04.2021

Using (POS) by Latifa :

# Project : EId - 2021

E → 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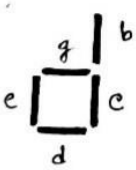
d → 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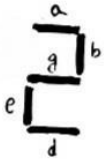
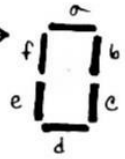
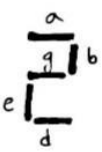
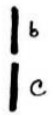
2 → 


0 → 


2 → 


1 → 


## Truth Table :

| Words and Decimal numbers | Inputs | | | outputs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | c | d | e | f | g |
| E | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| I | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| d | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| — | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

## The POS Equations :

a : $(A+B+\bar{C})(A+\bar{B}+C)(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

b : $(A+B+C)(A+\bar{B}+\bar{C})$

c : $(A+B+C)(A+\bar{B}+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+C)$

d : $(A+B+\bar{C})(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

e : $(A+B+\bar{C})(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

f : $(A+B+\bar{C})(A+\bar{B}+C)(A+\bar{B}+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+C)(\bar{A}+\bar{B}+\bar{C})$

g : $(A+B+\bar{C})(\bar{A}+B+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

## for segment a:

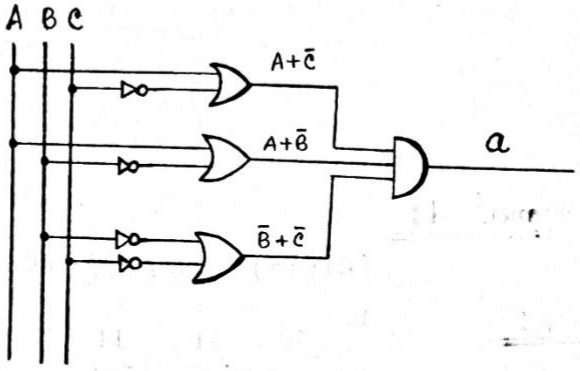
$(A+B+\bar{C})(A+\bar{B}+C)(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

## K-map:

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 |

$\therefore a = (A+\bar{C})(A+\bar{B})(\bar{B}+\bar{C})$

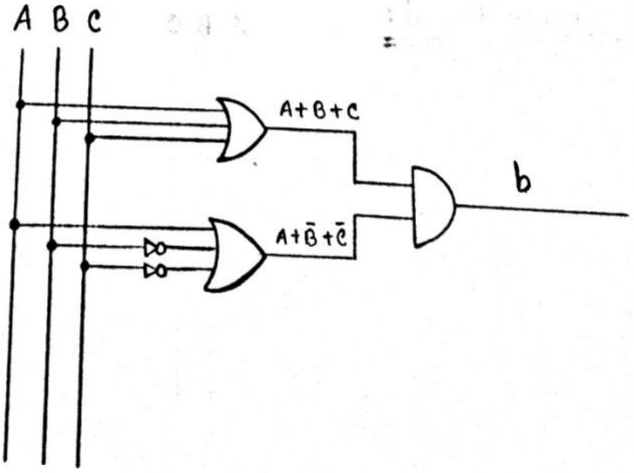
## Logic circuit for a:




## for segment b:

$(A+B+C)(A+\bar{B}+\bar{C})$

## Logic circuit for b:



for segment c :

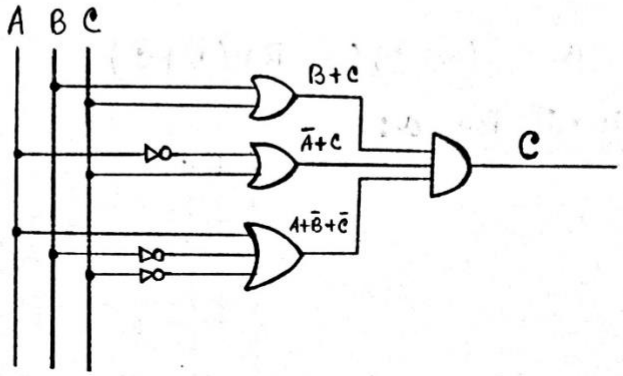
$$(A+B+C)(A+\bar{B}+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+C)$$

K-map :

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |

$$\therefore \quad C = (B+C)(\bar{A}+C)(A+\bar{B}+\bar{C})$$

Logic circuit for c :




for segment d :

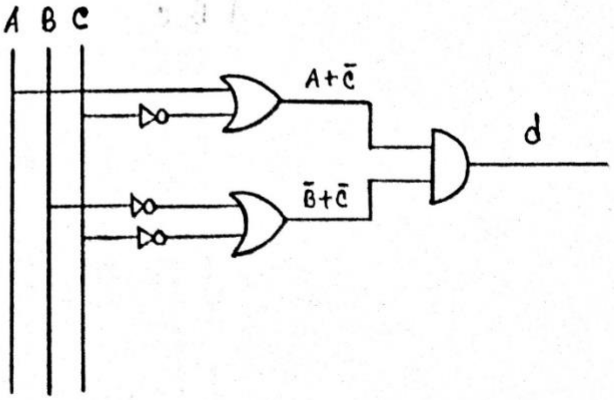
$$(A+B+\bar{C})(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$$

K-map :

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 |

$$\therefore \quad d = (A+\bar{C})(\bar{B}+\bar{C})$$

Logic circuit for d :



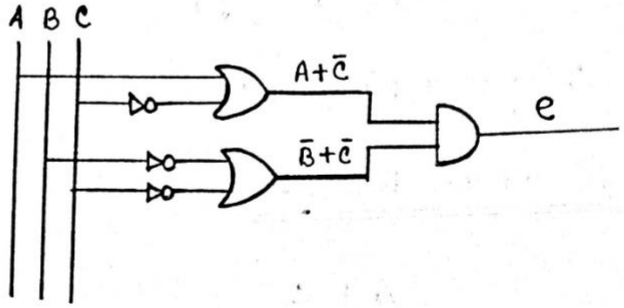
for segment e : $(A+B+\bar{C})(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+\bar{C})$

K-map :

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 |

$\therefore e = (A+\bar{C})(\bar{B}+\bar{C})$

Logic circuit for e :



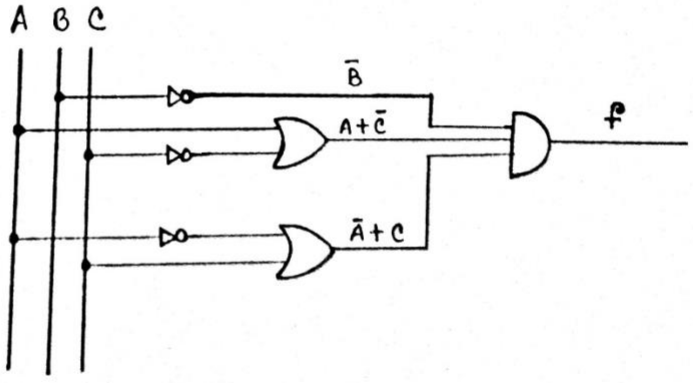

for segment f :

$(A+B+\bar{C})(A+\bar{B}+C)(A+\bar{B}+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+C)(\bar{A}+\bar{B}+\bar{C})$

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 |

$\therefore f = \bar{B} \cdot (A+\bar{C}) \cdot (\bar{A}+C)$

Logic circuit for f :



## for segment g:

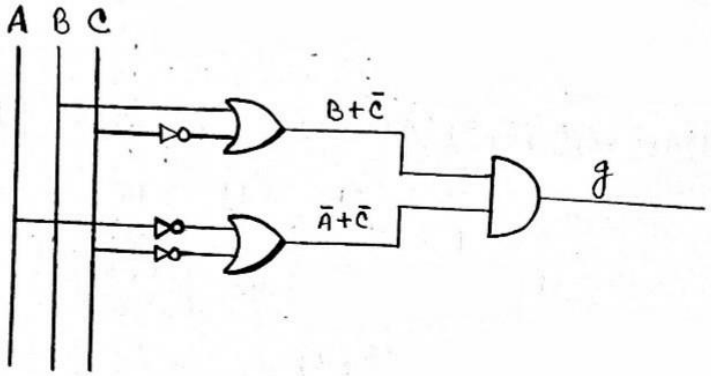
$$(A+B+\bar{C})(\bar{A}+B+\bar{C})(\bar{A}+\bar{B}+\bar{C})$$

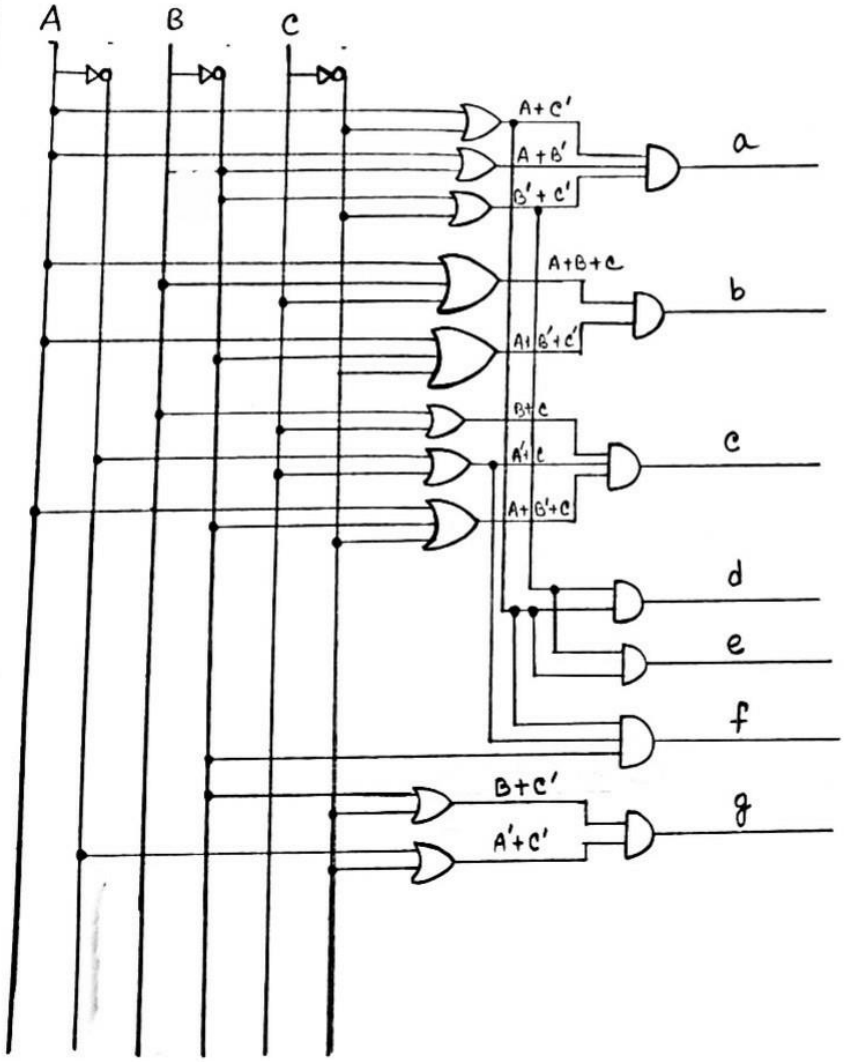
## K-map:

| A \ BC | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |

$$\therefore g = (B+\bar{C})(\bar{A}+\bar{C})$$

## Logic circuit for g:






Project figure : The seven segment Decoder circuit for Eid - 2021

Using (SOP) by Arman:

Project Name : EID-2021 (Display by seven segment decoder).

| Decimal | BCD inputs | | | Outputs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Numbers | A | B | C | a | b | c | d | e | f | g |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 2 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 5 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 6 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 7 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

Equations :

$a = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C}$

$b = \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC.$

$c = \bar{A}B\bar{C} + A\bar{B}C + ABC.$

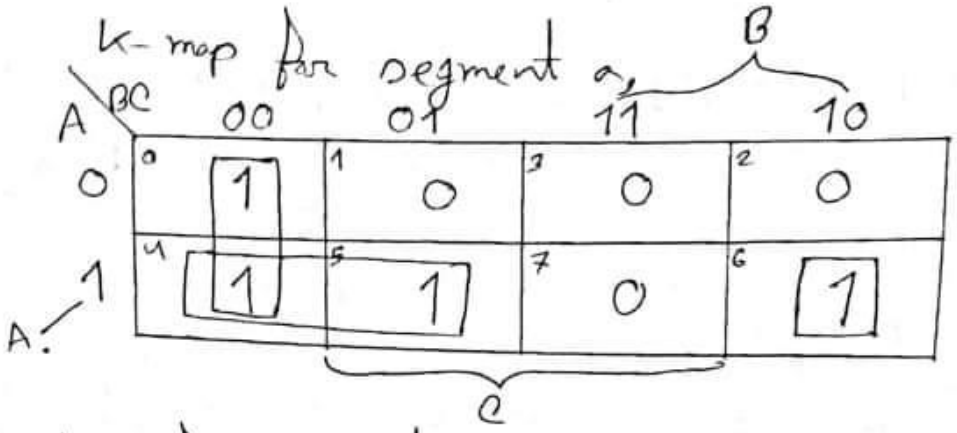
$d = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C}$

$e = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C}$

$f = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C.$

$g = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + AB\bar{C}$

K-map for segment a,




∴ Logic for segment a = $\bar{B}\bar{C} + A\bar{B} + A\bar{C}$

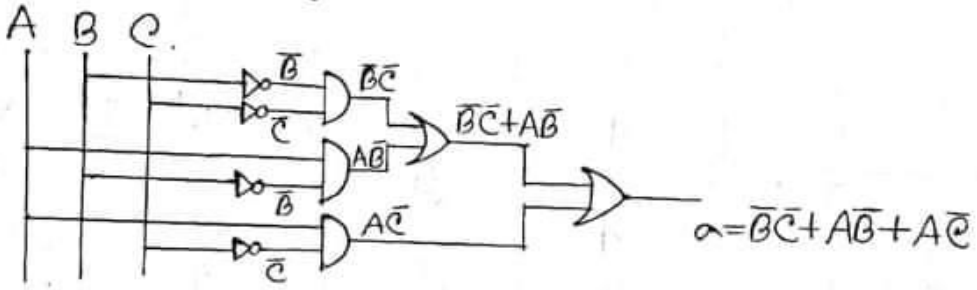
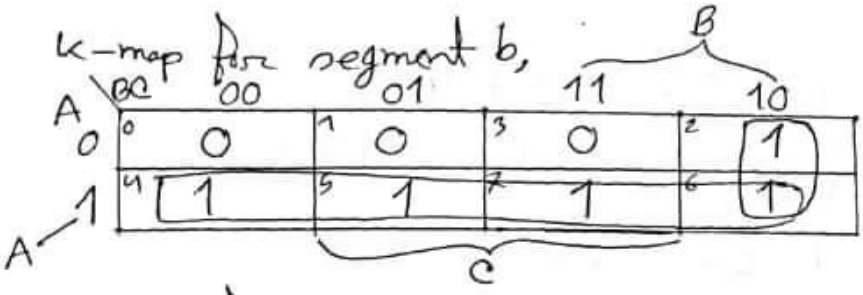



Figure: Logic circuit for segment a.

K-map for segment b,




∴ Logic for segment b = $B\bar{C} + A$

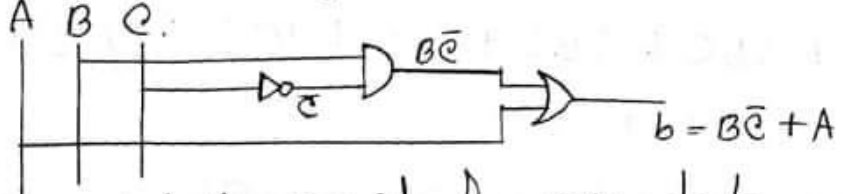
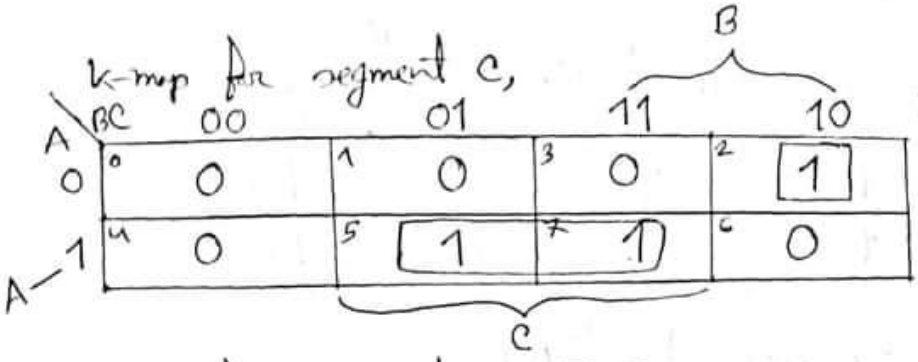



Figure: Logic circuit for segment b.




∴ Logic for segment c = $\bar{A}B\bar{C} + AC$.

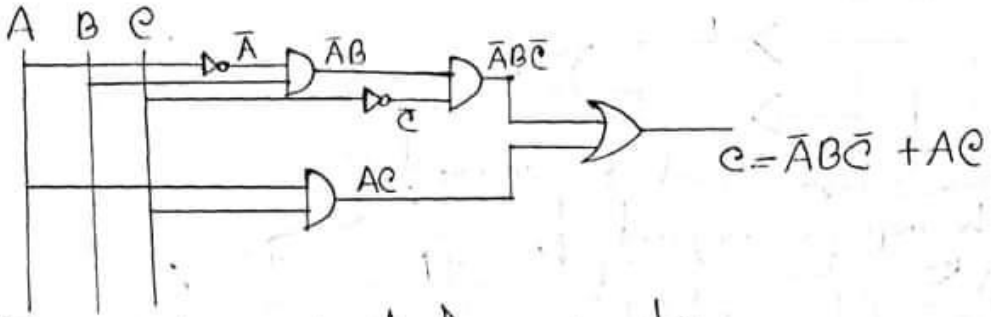
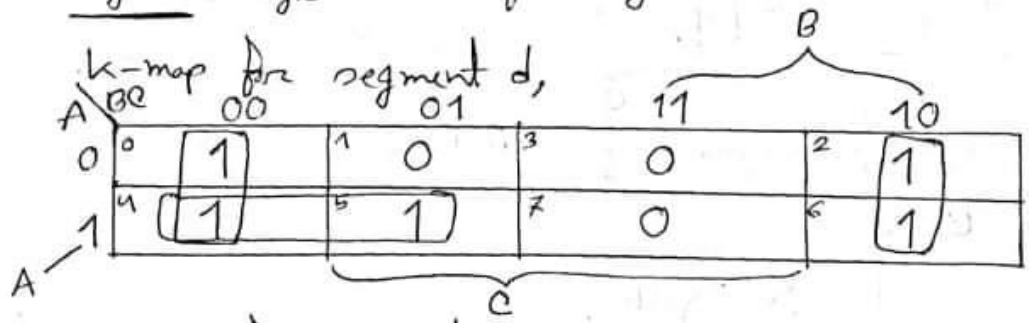



Figure : Logic circuit for segment c.




∴ Logic for segment d = $\bar{C} + A\bar{B}$

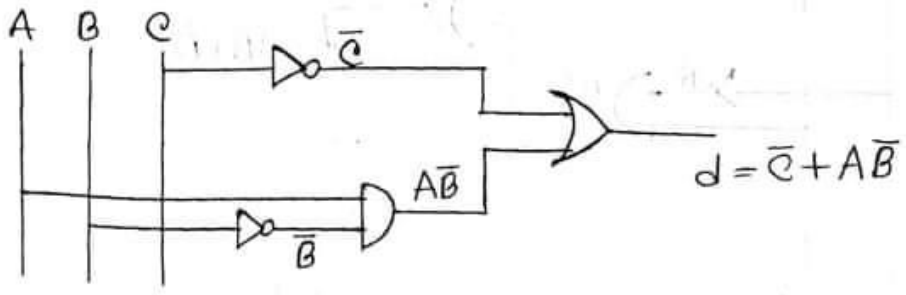
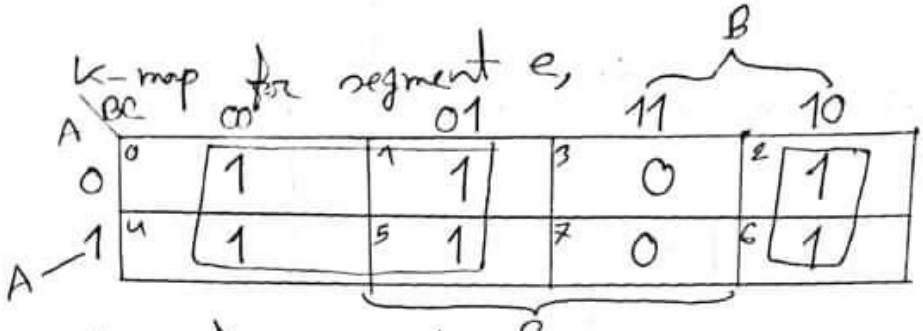



Figure : Logic circuit for segment d.

K-map for segment e,




∴ Logic for segment $e = \bar{B} + \bar{C}$

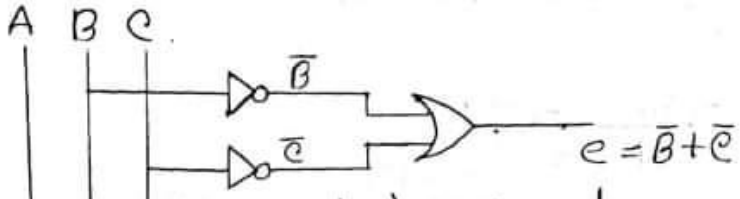
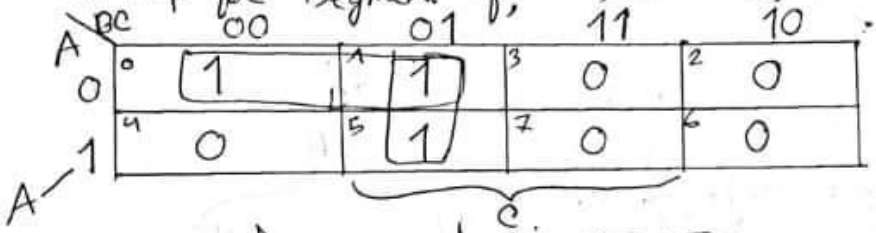



Figure : Logic circuit for segement e.

K-map for segment f,




∴ Logic for segment $f = \bar{A}\bar{B} + \bar{B}C$

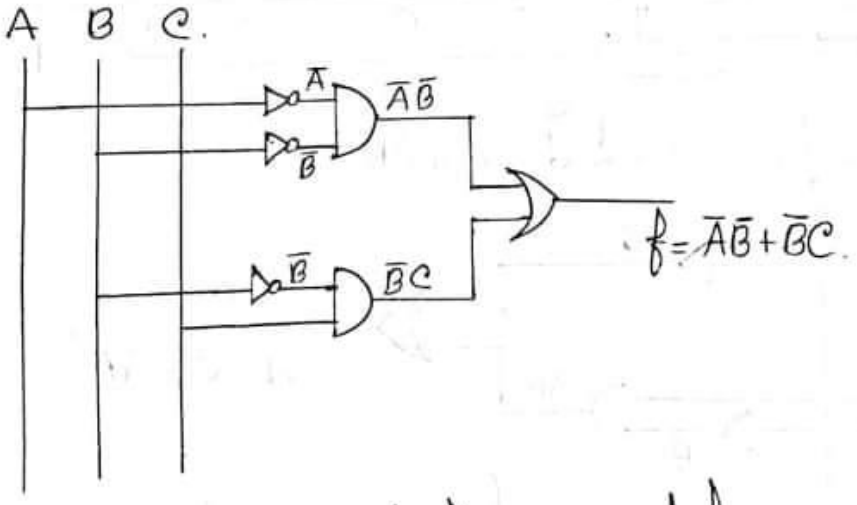
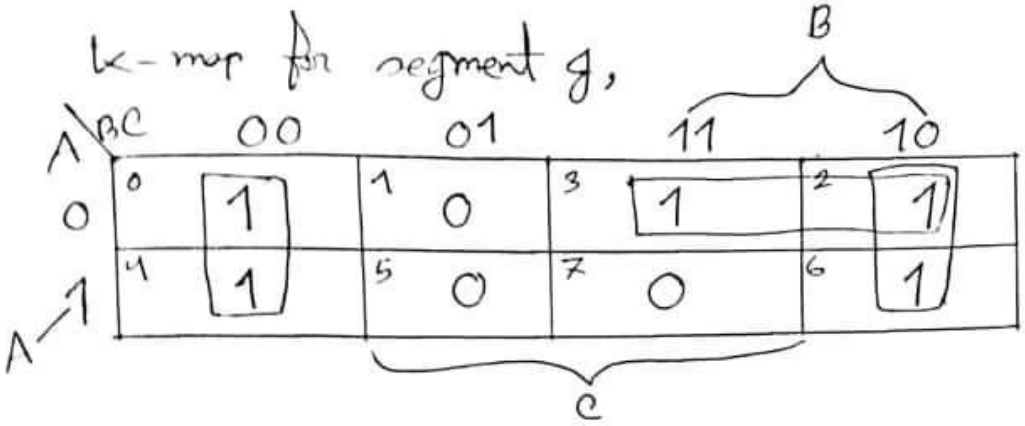



Figure : Logic circuit for segment f.

K-map for segment g,




∴ Logic for segment $g = \bar{C} + \bar{A}B$.

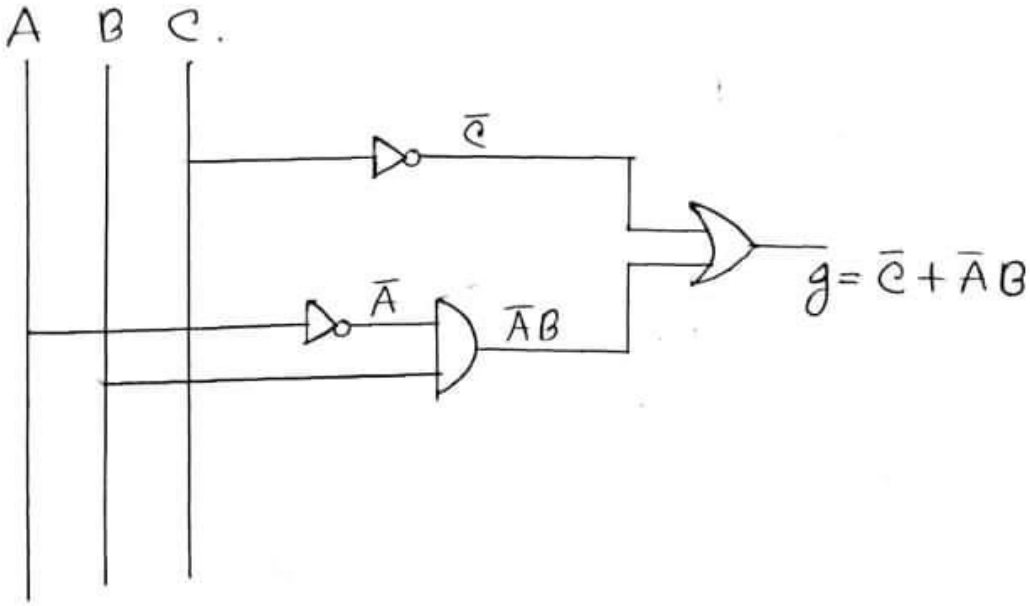



Figure : Logic circuit for segment g.

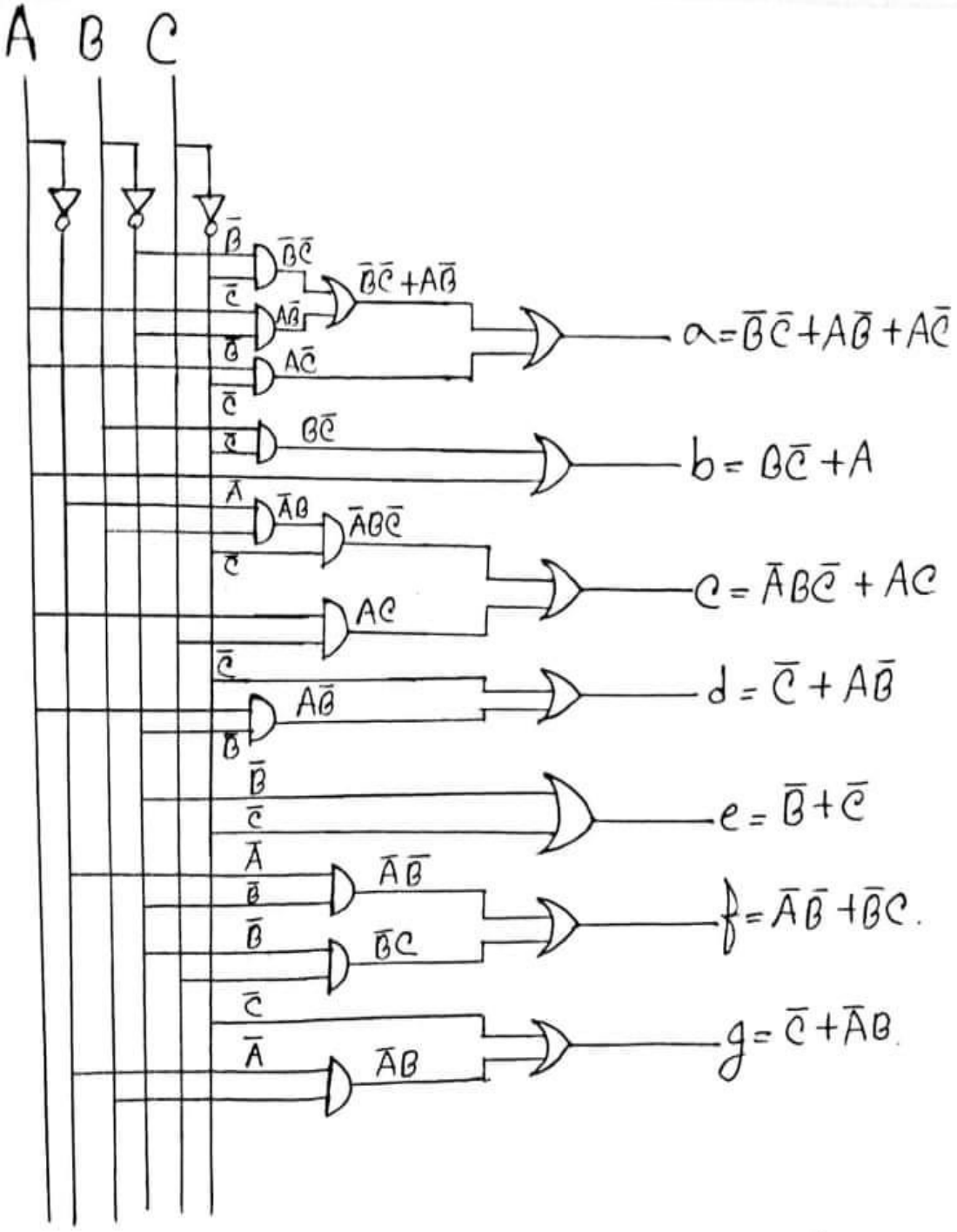
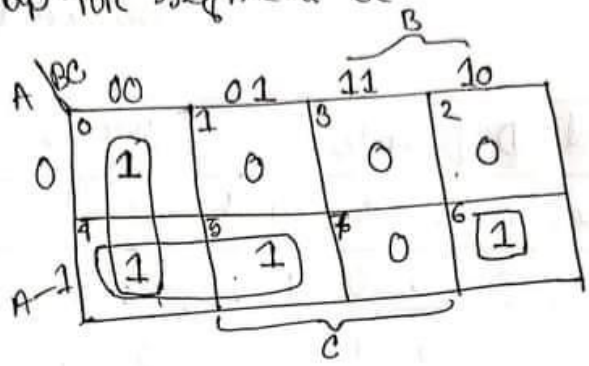



Figure: The Seven Segment Decoder circuit for EID-2021.

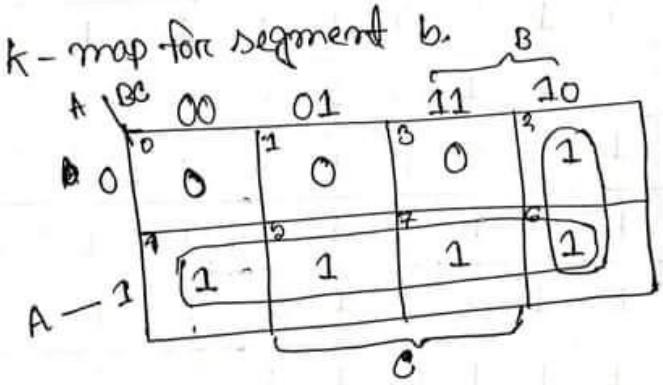
Using (SOP -NAND) by Ariful:

K-map

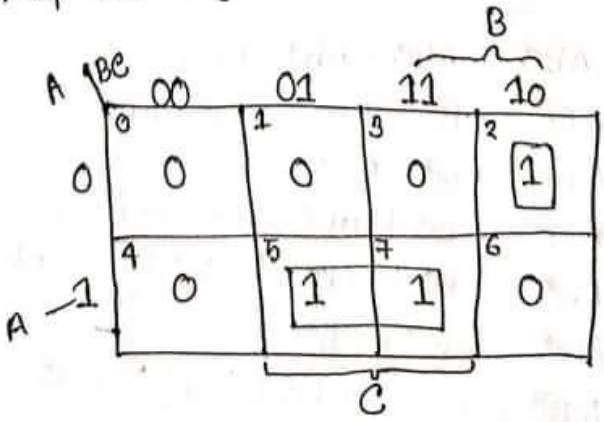
K map for segment a



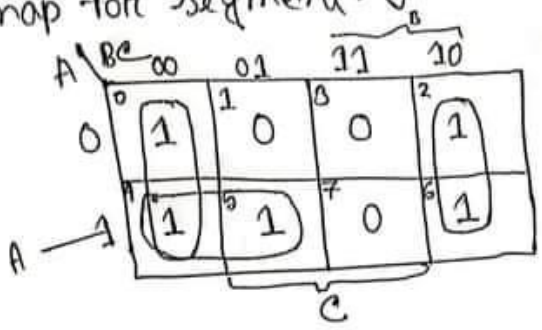

K-map for segment b.



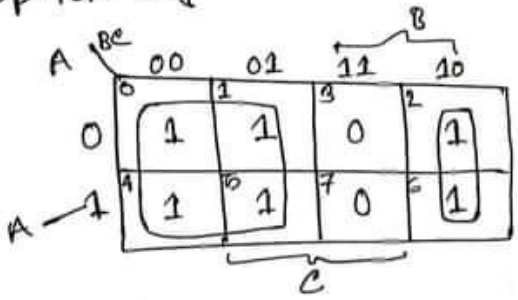

k-map for segment C



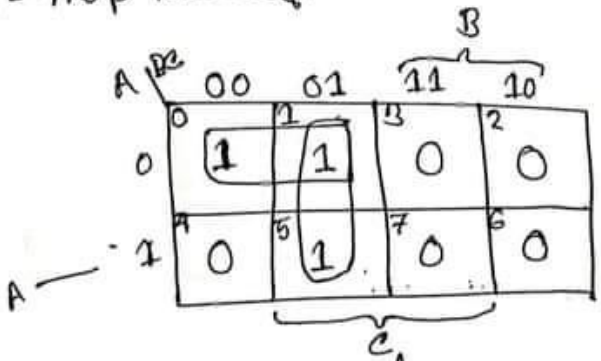
K-map for segment-d



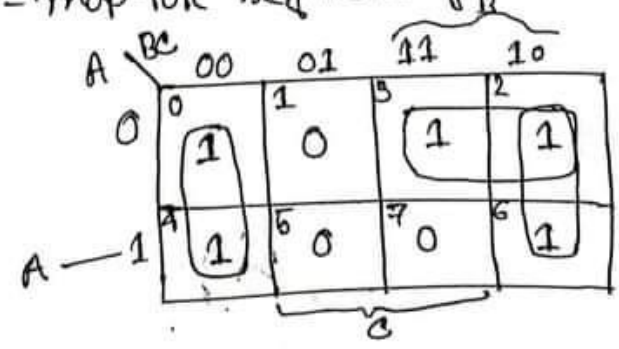

K-map for segment e




K-map for segment f




K-map for segment g



∴ Logic for segment $a = B\bar{C} + A\bar{B} + A\bar{C}$

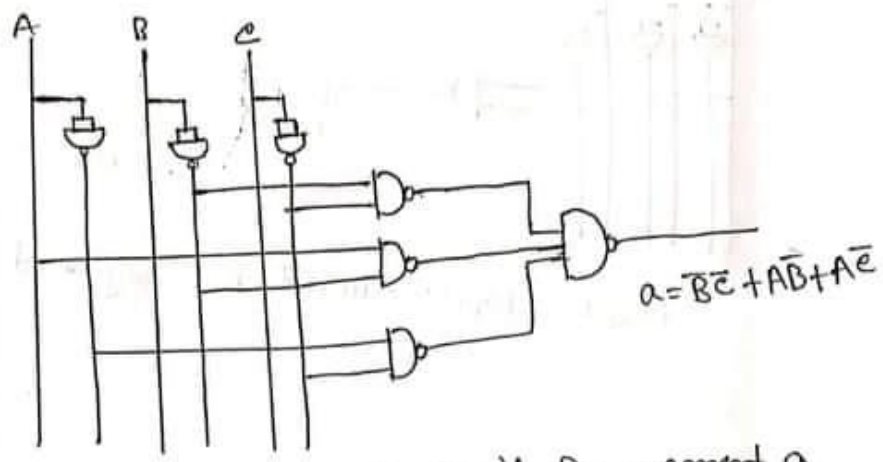



Figure: Logic circuit for segment a

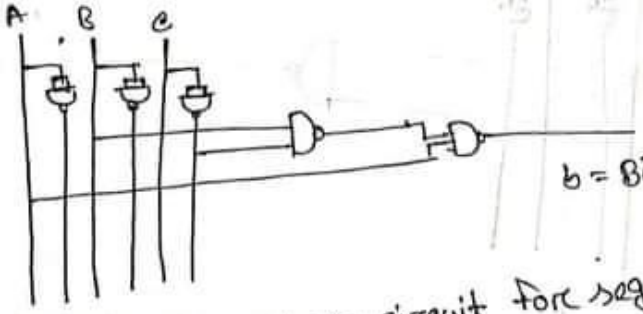



Figure: Logic circuit for segment b

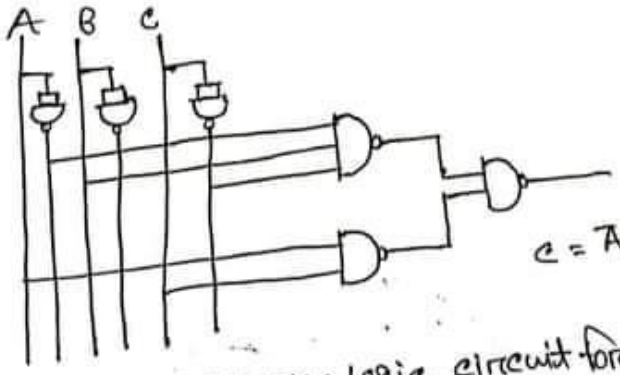



Figure: Logic circuit for segment c

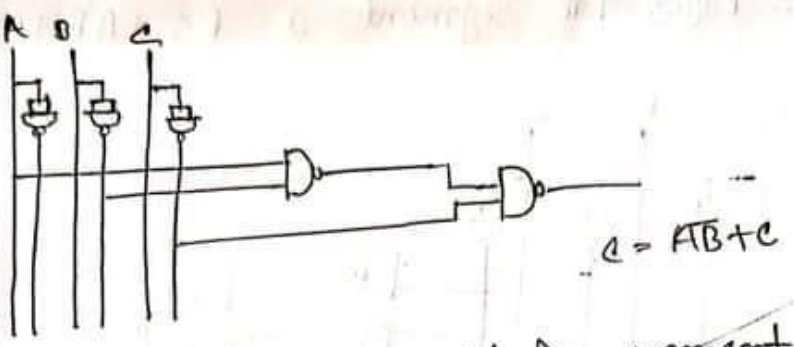



Figure: Logic circuit for segment d

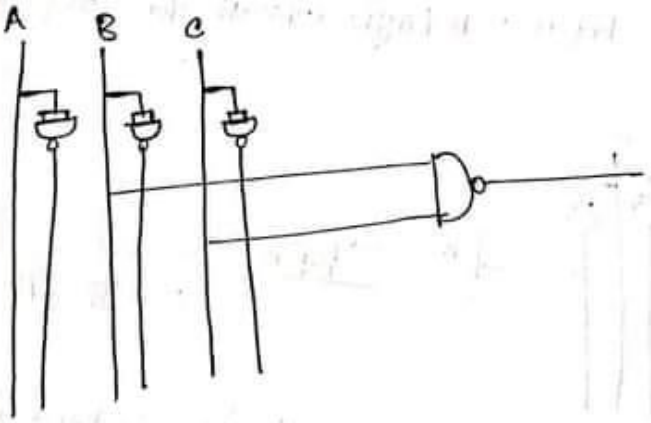



Figure : Logic circuit for segment e

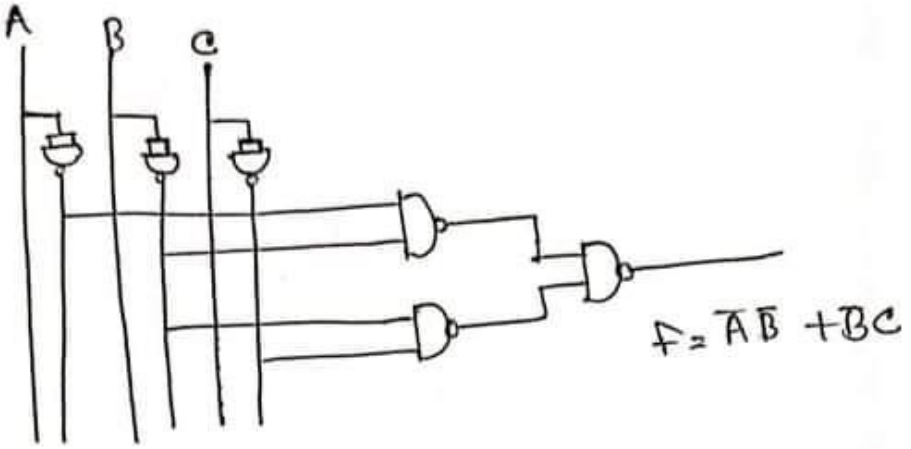



Figure: Logic circuit for segment f

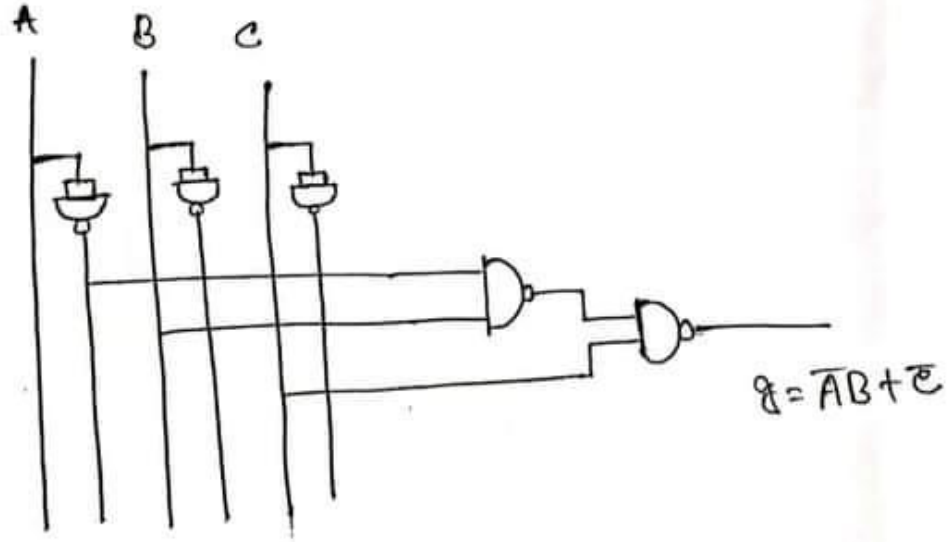



Figure: Logic circuit for segment g.

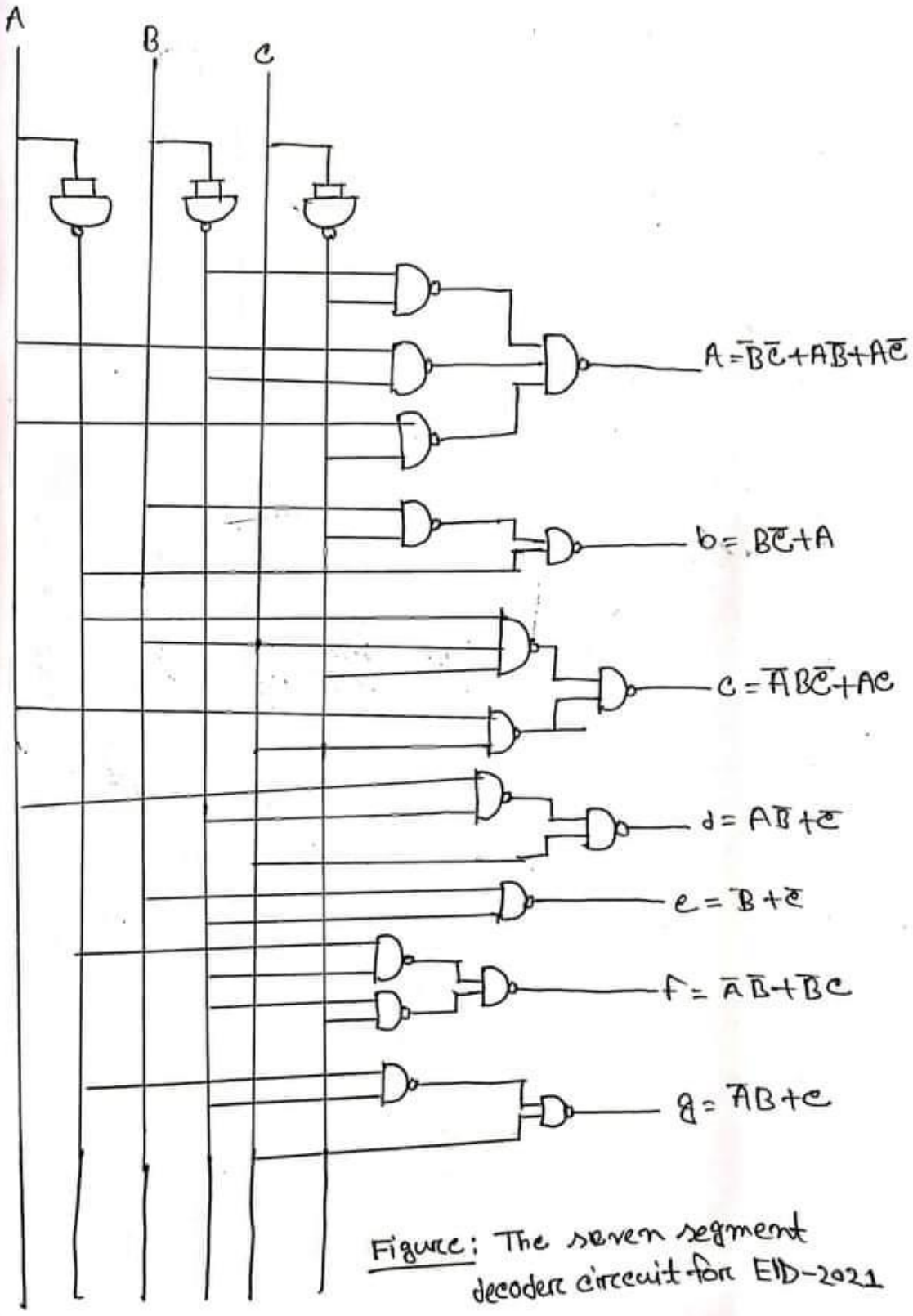
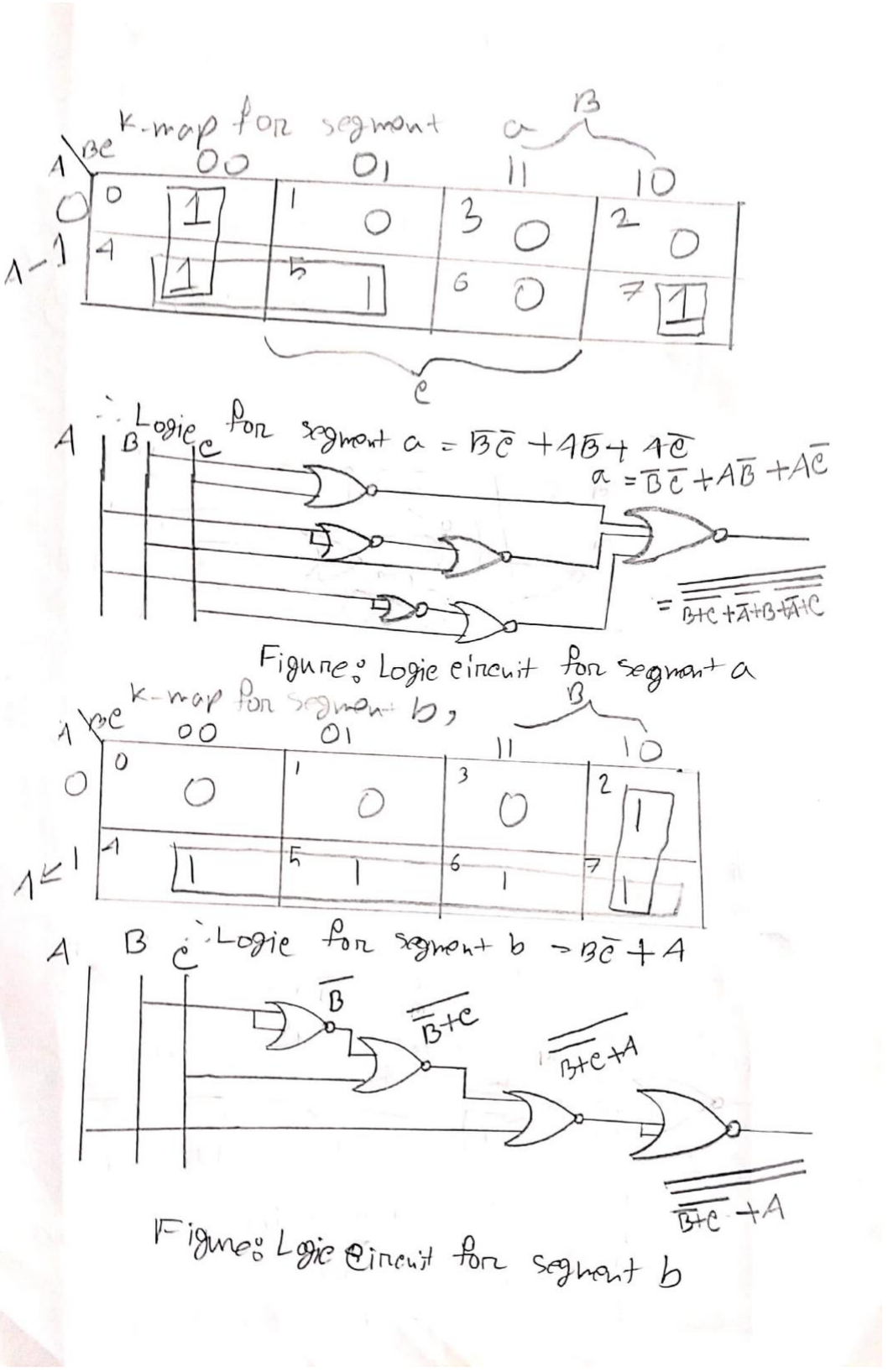
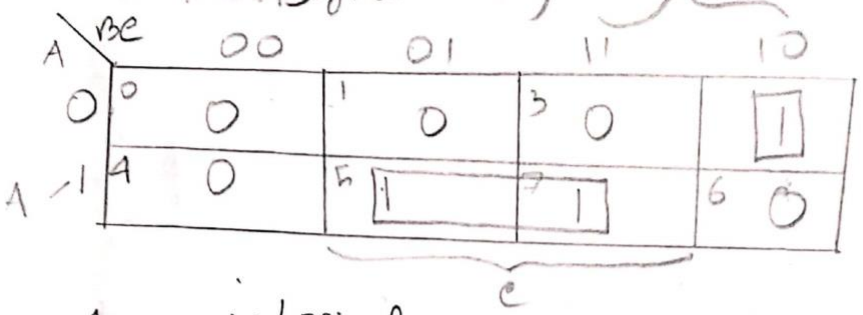



Figure: The seven segment decoder circuit for EID-2021

Using (SOP – NOR) by Raiyan:



K-map segment c,




∴ Logic for segment $c = \bar{A}B\bar{C} + AC$

$c = \bar{A}B\bar{C} + AC$

$= \overline{\bar{A}B\bar{C}} + \overline{AC}$

$= A + \bar{B} + C + \bar{A} + \bar{C}$

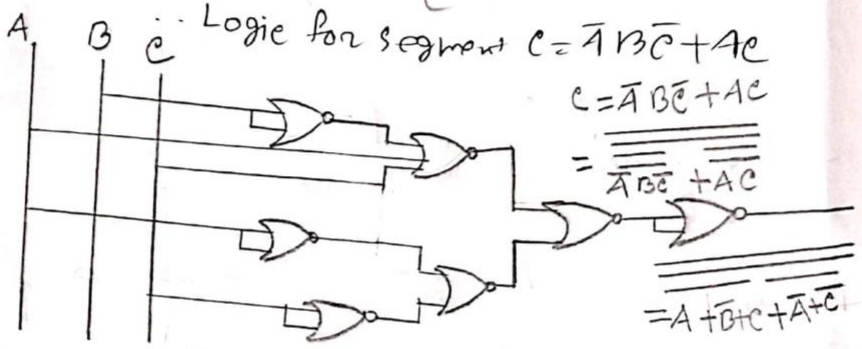
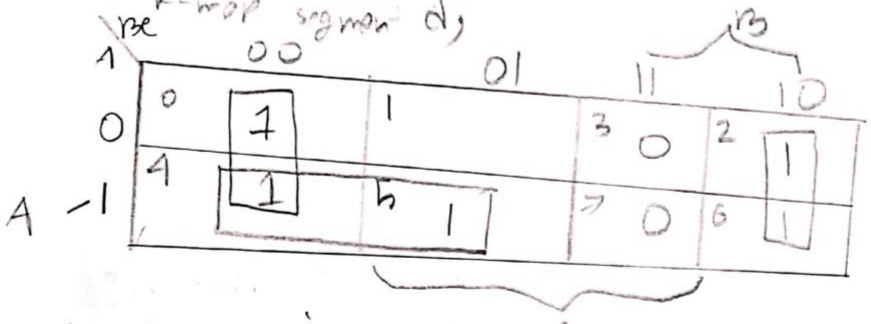



Figure: Logic circuit for segment c

K-map segment d;




∴ Logic for segment $d = \bar{C} + AB$

$d = \bar{C} + A\bar{B}$

$= \overline{\bar{C} + \bar{A} + B}$

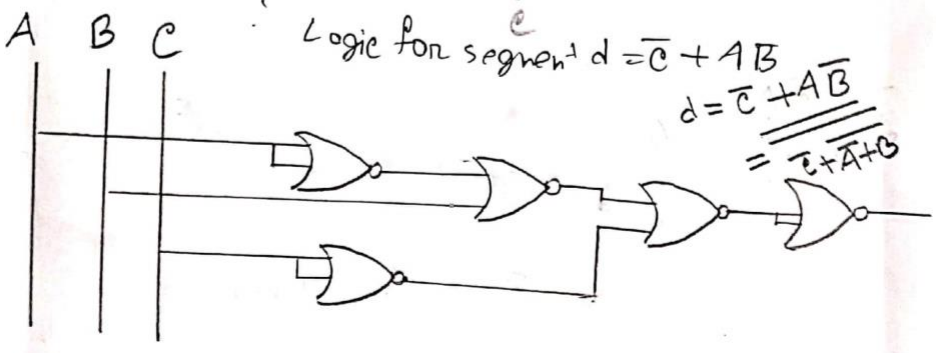
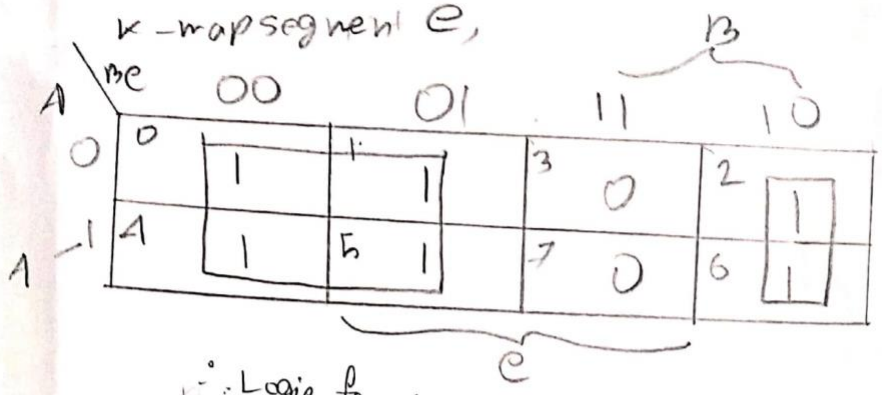



Figure: Logic circuit for segment d

K-map segment e,




Logic for segment $e = \bar{B} + \bar{C}$

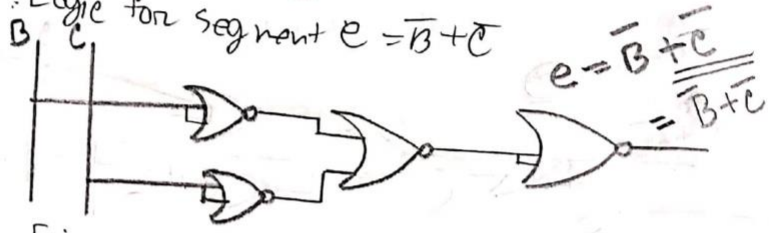
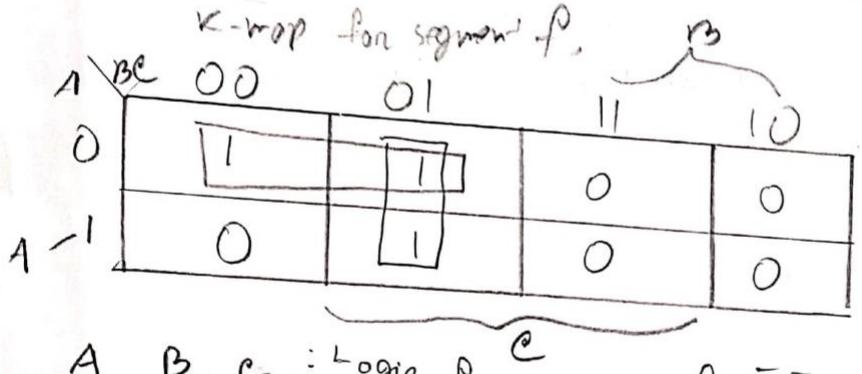



Figure: Logic circuit for segment $e = \bar{B} + \bar{C}$

K-map for segment f,




A B C : Logic for segment $f = \bar{A}\bar{B} + \bar{B}C$

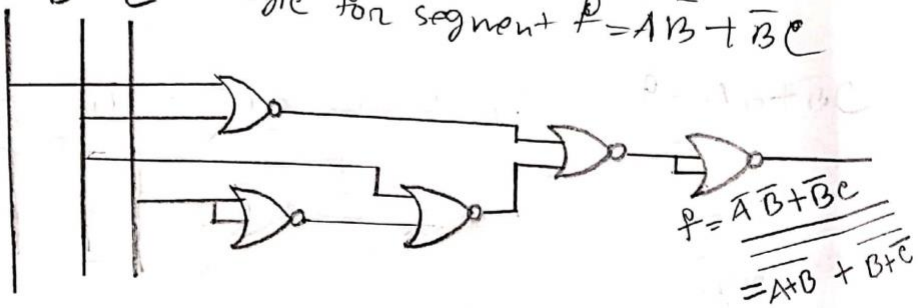
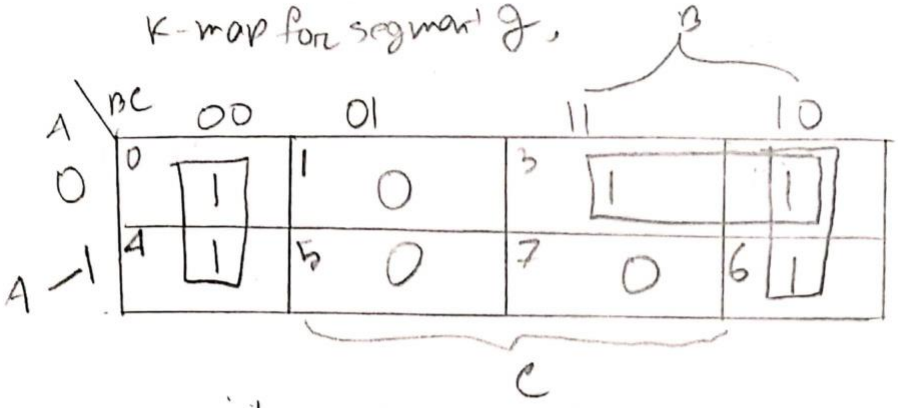



Figure: Logic circuit for segment f

K-map for segment g.




∴ Logic for segment $g = \bar{C} + \bar{A}B$

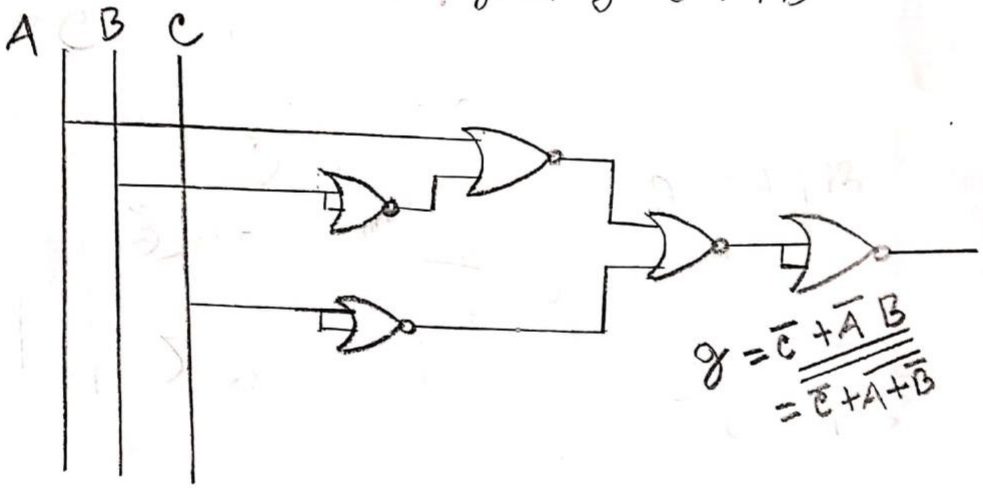



Figure: Logic circuit for segment g

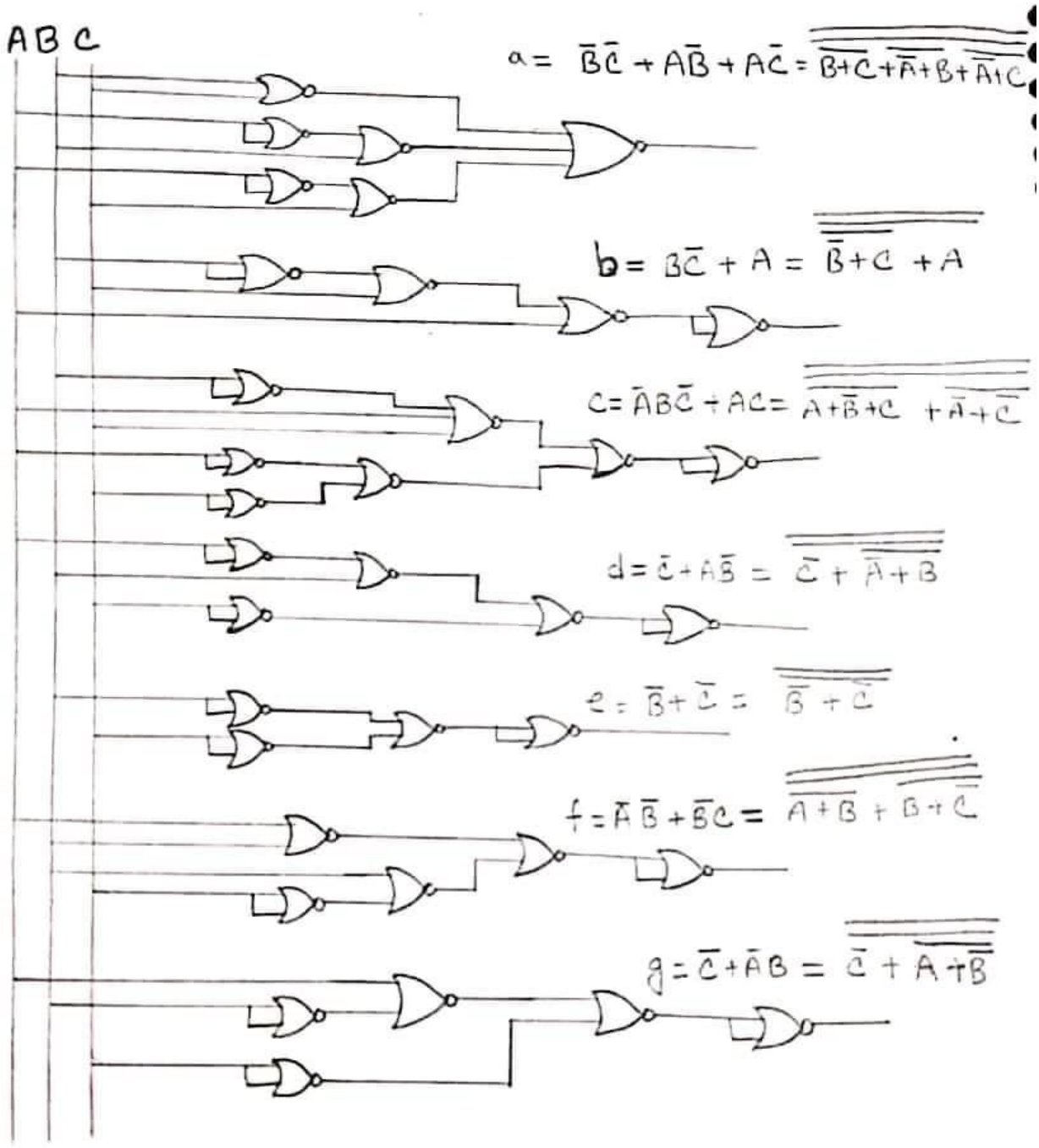



Figure : The seven segment decoder circuit for EID-2021