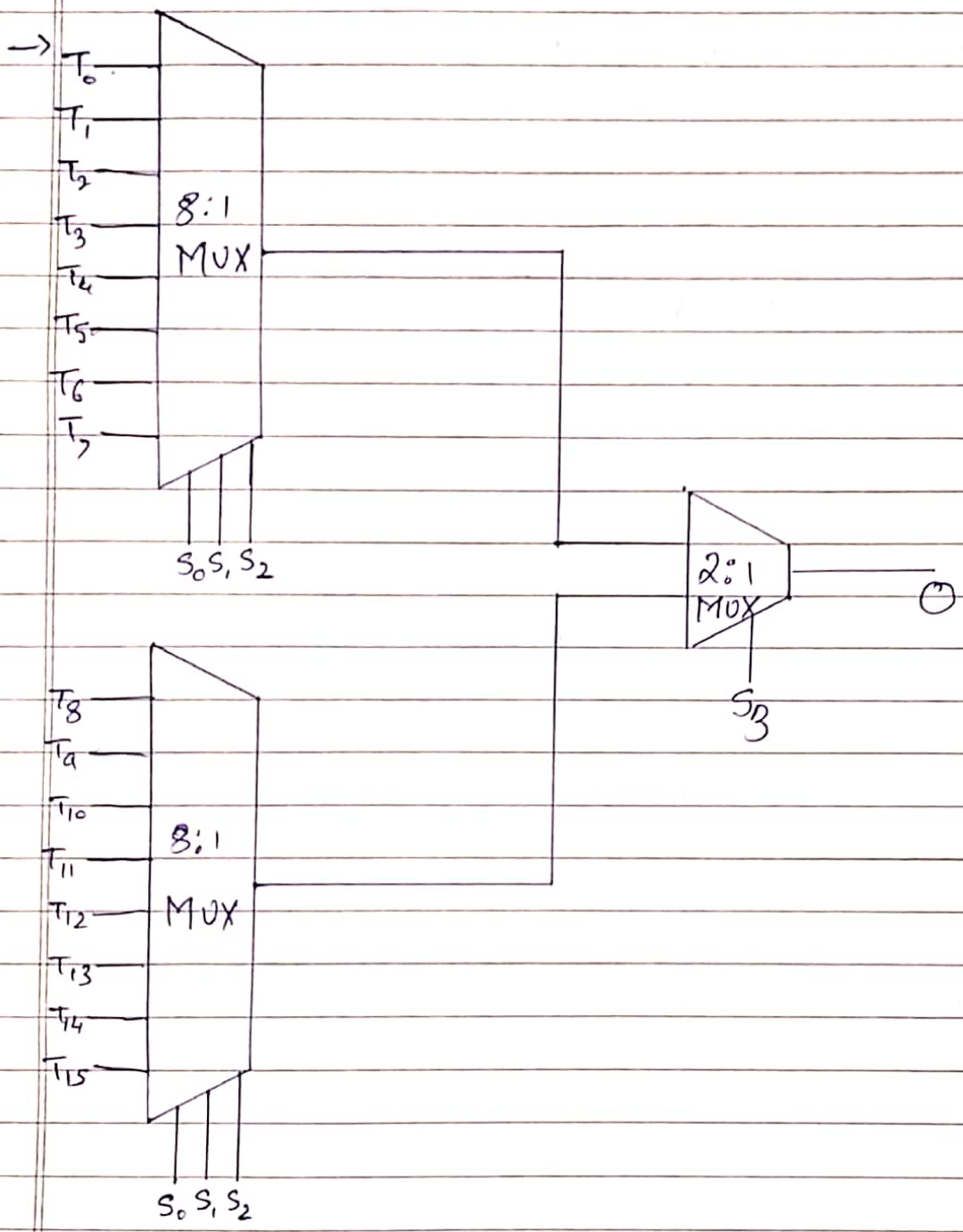
PEE GA 5 Varun Khadayate A016 70382019028

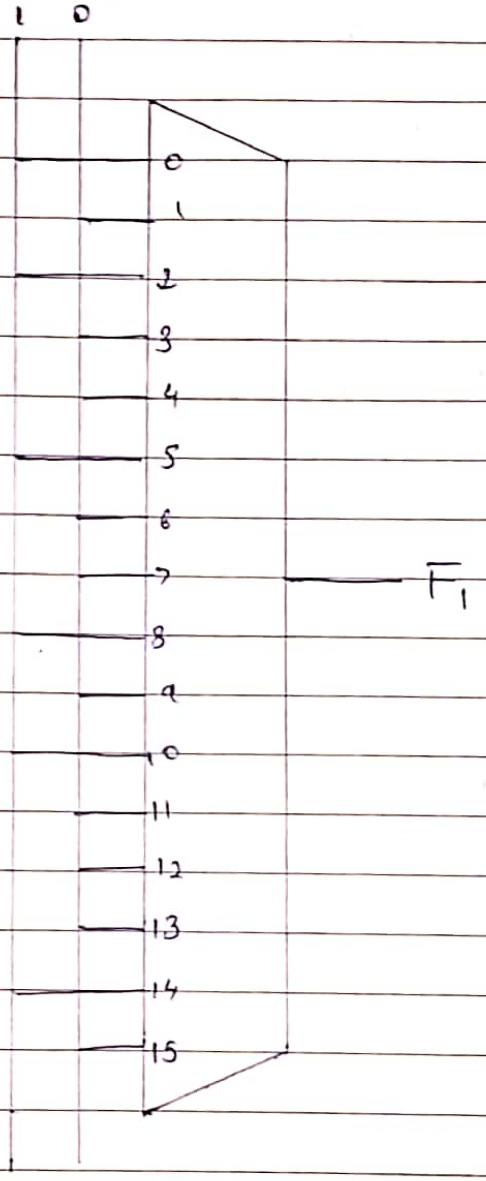
Q1. Construct a 16:1 multiplexer with 28:1 and 12:1 multiplexer. Use Block diagram?



Q2 Implement the following boolean ~~expression~~ function with a multiplexer. Draw Block diagram only.

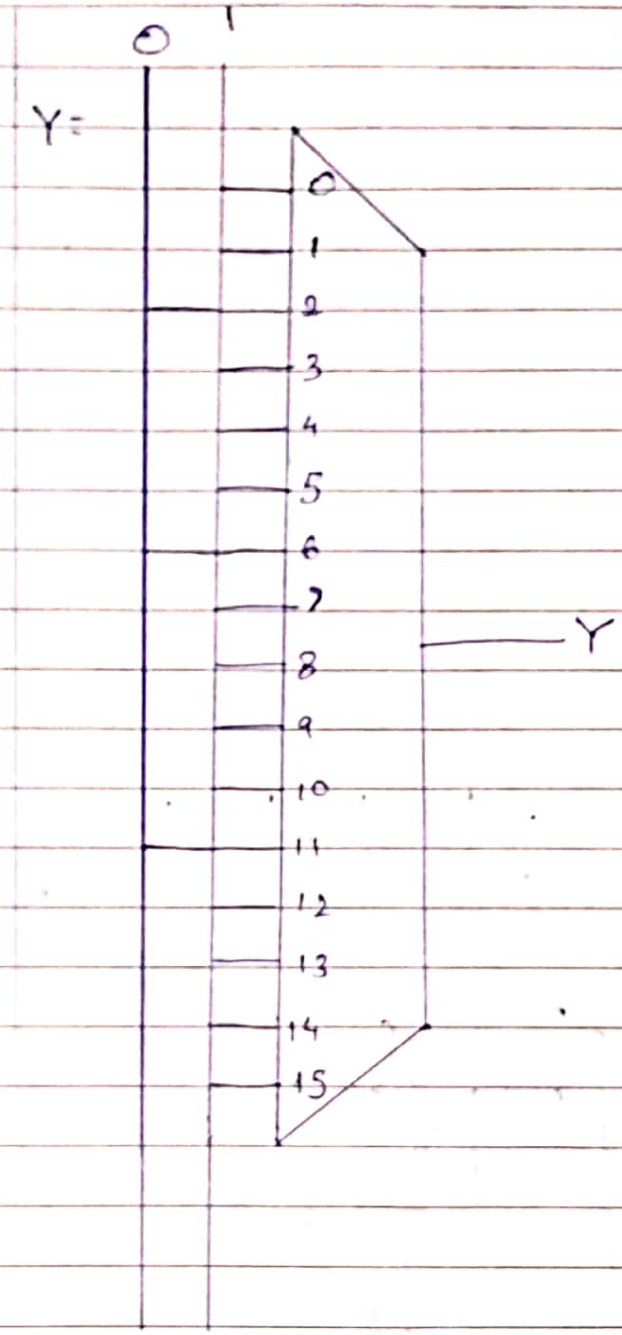
a. $F_1(A,B,C,D) = \Sigma m(0,2,5,8,10,14)$

A	B	C	D	F_1
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0



b $F_2 = \pi M(2, 6, 11)$

	A	B	C	D	Y
0	0	0	0	0	1
1	0	0	0	1	1
2	0	0	1	0	0
3	0	0	1	1	1
4	0	1	0	0	1
5	0	1	0	1	1
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	1
9	1	0	0	1	1
10	1	0	1	0	1
11	1	0	1	1	0
12	1	1	0	0	1
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	1



Q3 Implement a full adder with 24:1 multiplexer?

	INPUTS			OUTPUTS	
→	A	B	C	S	C
	0	0	0	0	0
	0	0	1	1	0
	0	1	0	1	0
	0	1	1	0	1
	1	0	0	1	0
	1	0	1	0	1
	1	1	0	0	1
	1	1	1	1	1

$S = \underbrace{A \oplus B \oplus C}_{\text{Exp. for SUM}} = \Sigma m(1,2,4,7)$

$C = \underbrace{AB + BC + CA}_{\text{Exp. for CARRY}} = \Sigma m(3,5,6,7)$

Using MUX TREE and BC as select ~~time~~ line

For SUM :-

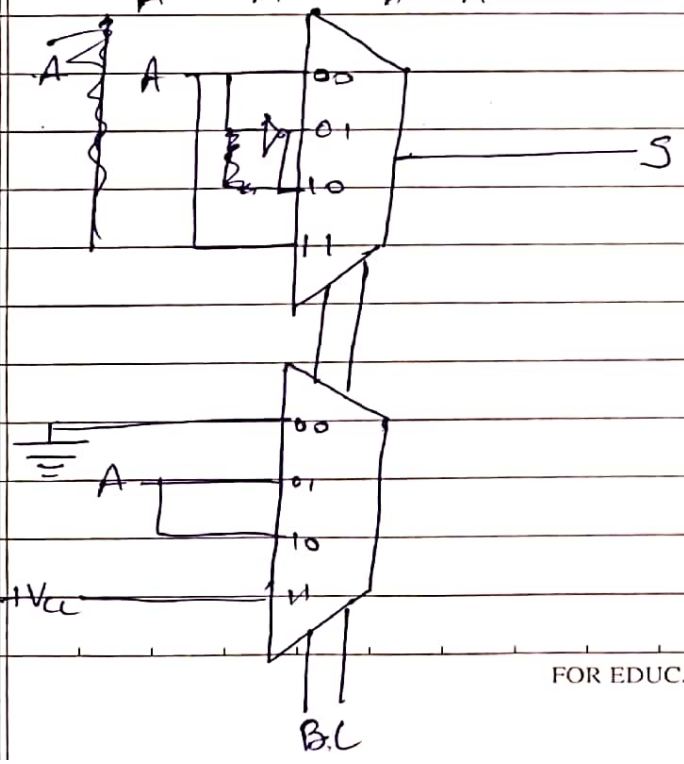
	I_0	I_1	I_2	I_3
$\bar{A}$	0	(1)	(2)	3
A	(4)	5	6	(7)

For CARRY

	I_0	I_1	I_2	I_3
$\bar{A}$	0	1	2	(3)
A	4	(5)	(6)	(7)

A $\bar{A}$ $\bar{A}$ A

0 A A 1



Q4. An 8:1 multiplexer has inputs A, B, C connected to the selection inputs S_2, S_1, and S_0 respectively. The data inputs I_0 through I_7 is as follows:-

1. $I_1 = I_2 = I_7 = 0$; $I_3 = I_5 = 1$; $I_0 = I_4 = D$; $I_6 = \bar{D}$

A	B	C	O	
0	0	0	i_0	D
0	0	1	i_1	0
0	1	0	i_2	0
0	1	1	i_3	1
1	0	0	i_4	D
1	0	1	i_5	1
1	1	0	i_6	$\bar{D}$
1	1	1	i_7	0

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

$= \bar{B}\bar{C}D(A+\bar{A}) + C(\bar{A}\bar{B} + A\bar{B}) + AB\bar{C}\bar{D}$

$= \bar{B}\bar{C}D + C(A \oplus B) + AB\bar{C}\bar{D}$

b. $i1 = i2 = 0$, $i3 = i7 = 1$; $i4 = i5 = D$; $i0 = i6 = \bar{D}$

A	B	C	Y	
0	0	0	i0	$\bar{D}$
0	0	1	i1	0
0	1	0	i2	0
0	1	1	i3	1
1	0	0	i4	D
1	0	1	i5	D
1	1	0	i6	$\bar{D}$
1	1	1	i7	1

$F = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC + A\bar{B}\bar{C}D + A\bar{B}CD + AB\bar{C}\bar{D} + ABC$

$= \bar{A}\bar{B}\bar{C}\bar{D} + BC(A + \bar{A}) + A\bar{B}D(C + \bar{C}) + AB\bar{C}D$

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