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32 Segment Display for Bengali Alphanumeric Characters

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Abstract- The focus of this paper is on the design that can display all the Bengali numbers and characters (vowels and consonants) by 32 segments and which is more efficient and compact than the previous designs, and it has a better outlook. As there are a total of 50 characters in Bengali alphabets and 10 symbols for number representations, 6 bits are required for representing each character and digit. Appropriate truth tables, expressions and block diagrams are provided to explain the design.

Keywords- *32 segment display; decoder; 6 variable representation; K-map, sum of product (SOP)*

I. INTRODUCTION

Segmentation of whole characters in Bengali language is a quite tricky problem. Different schemes have been proposed in recent years for a reasonable segmented display with less memory for character representation (Islam *et al.*, 2003; Hossain and Habib, 2004, Saber *et al.*, 2002; Arefin *et al.*, 2004; Jaigirdar *et al.*, 2010). But there is no standard display system for Bengali alphanumeric characters.

Design of 17 segment display unit for only Bengali vowels is presented by Islam *et al.* (2003). Hossain and Habib (2004) and Saber *et al.* (2002) proposed a joint seven-segment display and 11 segment display for Bengali digits. A design for 24 segment display was implemented (Arefin *et al.*, 2004) which can display all the Bengali vowels, numbers and 10 consonants. Recently, a 34 segment architecture for Bengali and English language has been described (Jaigirdar *et al.*, 2010) which is too complex.

The purpose of this paper is to present a 32-segment display for displaying all the Bengali numerical digits, vowels, consonants. No two segments are intersected; and most of the segments are straight. To reduce complexity and make the implementation easier, we have designed a scheme in which only 4 variable minimization is required. It is also efficient and cost effective since we can display all Bengali characters and numerals in one design and we can extend it to display other characters of different languages without redesigning the circuit.

II. PROPOSED ARCHITECTURE

A. General Information

As our concern is only Bengali alphabets and numbers, so it requires to show 11 vowels, 39 consonants and 10 numeric symbols, a total of 60 character and a 6-bit binary input is necessary to compound each character. Considering the designs, logic minimization for 6-variable code by Karanuagh minimization method (k-map) or Quine Mc Cluskey method is much complicated. Therefore, first 2 bits are used for path selection of a 2 to 4 line decoder and finally 4 bits are used to represent characters.

B. 32-Segment Display Architecture

In our proposed architecture, the 32 segments are named as A1, A2, A3, A4, A5, A6, A-Z as mentioned in Fig. 1.

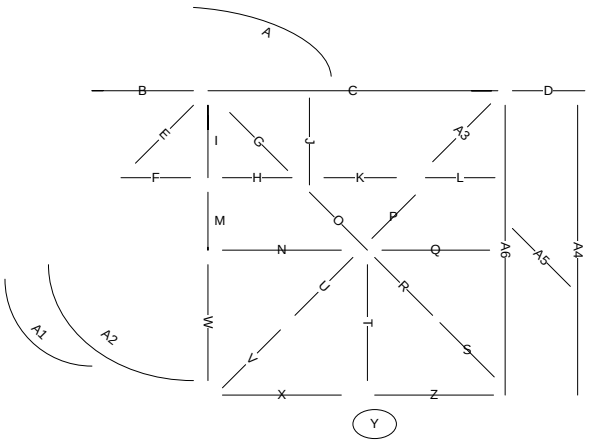

Figure 1. Proposed 32-segment grid architecture

C. Physical Appearance of Some Complex Characters

Here, in Fig. 2, 3 and 4, some numbers and characters are chosen on the basis of complexity and are shown randomly.

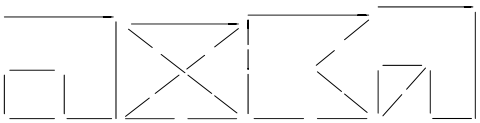

Figure 2. Some complex representations of Bengali nunmbers (1, 4, 5, 9 respectively)

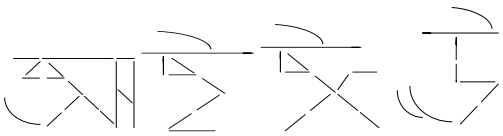

Figure 3. Some complex representations of Bengali vowels (Av, B, C, E, F, J respectively)

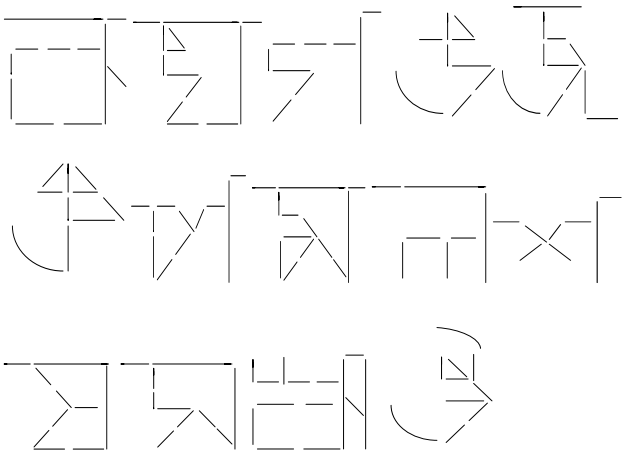

Figure 4. Some complex representations of Bengali consonants (K , L, M, O, R, T, c, g, j, k, l, m respectively)

D. Decoder Specification

To represent 32 bit, 6 variables are required as mentioned before. They are I_5, I_4, I_3, I_2, I_1 and I_0. A 2 to 4 line decoder is used to select the groups with the inputs I_5 and I_4. Each group selection is done by the decoder, described as below:

TABLE I. DECODER INFORMATION

Decoder Input		**Represents**
I_5	**I_4**	
0	0	Bengali Characters (A -O)
0	1	Bengali Characters(P - c)
1	0	Bengali Characters(d -r)
1	1	Bengali Characters & Numerals (s, t, u , 0 - 9)

III. TRUTH TABLE, ACTIVATED SEGMENTS BOOLEAN EXPRESSIONS AND CIRCUIT DESIGN

A. Truth Table

Here, we present the truth tables for the groups of characters connected with the decoder as declared above. In the truth tables below, only I_3, I_2, I_1 and I_0 are shown to reduce clumsiness pagination anywhere in the paper.

TABLE II. TRUTH TABLE FOR DECODER OUTPUT 00 (I_5 & I_4)

	Input $I_3I_2I_1I_0$	A1	A2	A3	A4	A5	A6	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
অ	0000	0	1	0	0	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0	1	1	0	1	1	0	0	0	0
আ	0001	0	1	0	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	1	1	0	1	1	0	0	0	0
ই	0010	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0
ঈ	0011	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	0	0	1	0	0	1	1	0	1	1	0	1	1	0	0	0	0
উ	0100	0	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0
ঊ	0101	1	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0
ঋ	0110	0	0	0	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	1	1	0	1
এ	0111	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
ঐ	1000	0	1	0	0	0	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
ও	1001	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0
ঔ	1010	0	1	0	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0
ক	1011	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1
খ	1100	0	0	0	0	0	1	0	1	1	1	0	0	1	1	1	0	0	0	1	1	0	0	0	0	0	0	1	1	0	1	0	1
গ	1101	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0
ঘ	1110	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	1	0	1
ঙ	1111	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0

TABLE III. TRUTH TABLE FOR DECODER OUTPUT 01 (I_5 & I_4)

	$I_3I_2I_1I_0$	A1	A2	A3	A4	A5	A6	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
চ	0000	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0
ছ	0001	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	1	1	1	0	0	1
জ	0010	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0	1
ঝ	0011	0	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1
ঞ	0100	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0
ট	0101	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0
ঠ	0110	0	0	0	0	0	0	1	1	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0
ড	0111	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0
ঢ	1000	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0
ণ	1001	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
ত	1010	0	1	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
থ	1011	0	0	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1
দ	1100	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0
ধ	1101	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	1	1	0	1
ন	1110	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	0
প	1111	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0	0	1	1	0	0	1	0	0	0	0	1	1	1	0	0	0

TABLE IV. TRUTH TABLE FOR DECODER OUTPUT 10 (I_5 & I_4)

	$I_3I_2I_1I_0$	A1	A2	A3	A4	A5	A6	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
ফ	0000	0	0	0	0	1	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	1
ব	0001	0	0	0	0	0	1	0	1	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1
ভ	0010	0	1	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0
ম	0011	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1	0	0	0	0	0	1	0	0	1	1	1	1	1	0	1	0	0
য	0100	0	0	0	0	0	1	0	1	1	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	1
য়	0101	0	0	0	0	0	1	0	1	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1
ল	0110	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0
শ	0111	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	1	0	0	1	1	0	1	0	0	1	0	0	0	0	0
ষ	1000	0	0	0	0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	1	0	1
স	1001	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1	0	0	0	0	0	1	0	0	1	1	0	1	1	0	0	0	0
হ	1010	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0
¶	1011	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	1	0	0	1	1	0	1	0	0	1	0	0	0	0	0
ড়	1100	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0
ঢ়	1101	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	0
য়	1110	0	0	0	0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	1	1
r	1111	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0

TABLE V. TRUTH TABLE FOR DECODER OUTPUT 11 (I_5 & I_4)

	$I_3I_2I_1I_0$	A1	A2	A3	A4	A5	A6	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
s	0000	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
t	0001	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0
u	0010	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
0	0011	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0
১	0100	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	1
২	0101	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	1
৩	0110	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
৪	0111	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	1	0	1
৫	1000	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	0	1	1	0	1
৬	1001	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	0	1	1	0	1
৭	1010	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0
৮	1011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0	0
৯	1100	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0

B. *Activated Segments*

Here, we have determined which segments to activate in order to display a particular digit or character mentioned in Table 6. As we kept the I_5 and I_4 separate, for every decoder output we need to find minimized equations for A1 to A6 and A to Z segments separately, but 4 variables minimization is easier than doing minimization of 6 variables.

TABLE VI. ACTIVE SEGMENT FOR EACH BENGALI DIGIT AND CHARACTERS

	I_5 I_4	I_3 I_2 I_1 I_0	
অ	00	0000	A2, A6, B, C, E, F, G, H, O, R, S, U, V
আ		0001	A2, A4-A6, B-H, O, R, S, U,V
ই		0010	A-C, G-J, O, U, X
ঈ		0011	A-C, G-I, L, O, P, R, S, U, V
উ		0100	A2, A-C, I, M, N, O, U, V
ঊ		0101	A1, A2, A-C, I, M, N, O, U, V
ঋ		0110	A4-A6, B-D, H-L, N, Q, W, X, Z
এ		0111	A2, E, F, I, M, W
ঐ		1000	A2, A, E, F, H, J, W
ও		1001	A2, G-I, N, U, W
ঔ		1010	A2, A, G-J, N, U, W
ক		1011	A5, A6, C, D, H, K, L, M, W, X, Z
খ		1100	A6, B-D, G-I, M, N, U, V, X, Z
গ		1101	A6, C, D, H, K, L, M, N, U
ঘ		1110	A6, B, C, D, M, N, U, V, X, Z
ঙ		1111	A2, M, N, U, V
চ	01	0000	B, C, I, M, N, U, V, W
ছ		0001	B, C, I, M-O, T, U-W, Z
জ		0010	A2, B, C, I, M, O, T, U, V, Z
ঝ		0011	A4-A6, B-D, H, K-M, W, X, Z
ঞ		0100	A2, E-I, M-O, W
ট		0101	A-C, I, M, U, V, W
ঠ		0110	A-C, G, I, J, M, O, U, V, W
ড		0111	A2, B, C, I, M, N, U, V
ঢ		1000	B, C, I, M, U-W
ণ		1001	A6, D, H, K-O
ত		1010	A2, B, C, E-H, O, U, V
থ		1011	A6, B-H, N, O, W, X, Z
দ		1100	B, C, I, M, T, U, V,W
ধ		1101	A6, B-D, H-L, N, Q, W, X, Z
ন		1110	A6, C, D, N, Q, U, V, W
প		1111	A6, B-D, F, H, K-N, Q
ফ	10	0000	A5, A6, B-D, H, K-M, W, X, Z
ব		0001	A6, B-D, H, K, L, M, W, X, Z
ভ		0010	A2, B, C, G-I, M, N, U, V
ম		0011	A6, B-D, H, I, O, R-V, X
য		0100	A6, B-D, G, I, O, U, V, X, Z
য়		0101	A6, B-D, H, K, L, M, W-Z
ল		0110	A6, C, D, N, Q, T, W
শ		0111	A6, C, D, H, L, O, P, R, U
ষ		1000	A6, B-D, G, O, Q, U, V, X, Z
স		1001	A6, B-D, H, I, O, R, S, U, V
হ		1010	B, C, G, H, I, O, U, V, X
ক্ষ		1011	A5, A6, C, D, H, L, O, P, R, U
ড়		1100	A2, B, C, I, M, N, U, V
ঢ়		1101	B, C, I, M, U, V, Y
য়		1110	A6, B-D, G, O, U, V, X, Y, Z
ৎ		1111	G, H, I, L, T
s	11	0000	G-I, N, R
t		0001	G-I, N, U, V, W
u		0010	A2, E-H, U, V
0		0011	C, I, M, W, X
১		0100	C, N, Q, W, X, Z
২		0101	G, O, U, V, X
৩		0110	A2, A6, E-H, O, U, V
৪		0111	A6, G, O, P, R, S, U, V, X, Z
৫		1000	G, I, M, P, R, S, W, S, Z
৬		1001	I, M, P, R, S, W, S, Z
৭		1010	A3, A6, C, I, M, N, Q
৮		1011	A3, C , I, M, N, Q, T, W, X
৯		1100	A3, A6, C, N, T, U, V, W

C. *Boolean Expressions*

Depending on the information in Table 6, we derived the following function for 32 segments in sum of product (SOP) form shown in Table 7.

TABLE VII. LOGIC FUNCTION FOR 32 SEGMENTS IN SUM OF PRODUCT (SOP) FORM

I_5 I_4	Segments	Functions
00	A1	$\sum(5)$
	A2	$\sum(0,1,4,5,7\text{-}10,15)$
	A3	------
	A4	$\sum(1, 6)$
	A5	$\sum(1, 6, 11)$
	A6	$\sum(0, 1, 6, 11, 12\text{-}14)$
	A	$\sum(2\text{-}5, 8,10)$
	B	$\sum(0\text{-}6, 12, 14)$
	C	$\sum(0\text{-}6, 11\text{-}14)$
	D	$\sum(1, 6, 11\text{-}14)$
	E	$\sum(0, 1, 7, 8)$
	F	$\sum(0, 1, 7, 8)$
	G	$\sum(0\text{-}3, 9, 10, 12)$

	H	∑(0, 3, 6, 8-13)
	I	∑(2-7, 9, 10, 12)
	J	∑(2, 6, 8, 10)
	K	∑(6, 11, 13)
	L	∑(3, 6, 11, 13)
	M	∑(4, 5, 7, 11-15)
	N	∑(4-6, 9, 10, 12-15)
	O	∑(0-5)
	P	∑(3)
	Q	∑(6)
	R	∑(0, 1, 3)
	S	∑(0, 1, 3)
	T	----------
	U	∑(0, 5, 9, 10, 12, 15)
	V	∑(0-5, 9, 10, 12, 14, 15)
	W	∑(6-8, 11)
	X	∑(2, 6, 11, 12, 14)
	Y	---------
	Z	∑(6, 11, 12, 14)
01	A1	--------
	A2	∑(2, 4, 7, 10)
	A3	--------
	A4	∑(3)
	A5	∑(3)
	A6	∑(3, 9, 11, 13-15)
	A	∑(5, 6)
	B	∑(0-3, 5-8, 10-13)
	C	∑(0-3, 5-8, 10-14)
	D	∑(3, 9, 11, 13-15)
	E	∑(4, 10, 11)
	F	∑(4, 10, 11, 15)
	G	∑(4, 6, 10, 11)
	H	∑(3, 4, 9-11, 13, 15)
	I	∑(0-2, 4-8, 12, 13)
	J	∑(6, 13)
	K	∑(3, 9, 13)
	L	3, 9, 13, 15
	M	∑(0-9, 12, 15)
	N	∑(0, 1, 4, 7, 9, 11, 13, 14)
	O	∑(1, 2, 4, 6, 9, 10, 11)
	P	∑(15)
	Q	∑(13, 14)
	R	----------
	S	----------
	T	∑(1, 2, 12)
	U	∑(0, 1, 2, 5-8, 10, 12, 14, 15)
	V	∑(0-2, 5-8, 10, 12, 14, 15)
	W	∑(0, 1, 3-6, 8, 11-15)
	X	∑(3, 11, 13)
	Y	--------
	Z	∑(1, 2, 3, 11, 13)
10	A1	--------
	A2	∑(2, 12)
	A3	--------
	A4	--------
	A5	∑(0)
	A6	∑(0, 1, 3-9, 11, 14)

	A	--------
	B	∑(0-5, 8-10, 12-14)
	C	∑(0-14)
	D	∑(0,1, 3-9, 11, 14)
	E	--------
	F	--------
	G	∑(0, 2, 4, 8, 10, 14, 15)
	H	∑(1-3, 5, 7, 9-11, 15)
	I	∑(2-4, 9, 10, 12, 13, 15)
	J	--------
	K	∑(1, 5)
	L	1, 5, 7, 11, 15
	M	∑(1, 2, 5, 12, 13, 15)
	N	∑(2, 6, 12)
	O	∑(0, 3, 4, 7-11, 14)
	P	∑(7, 11)
	Q	∑(6, 8)
	R	∑(3, 7, 9, 11)
	S	∑(3, 9)
	T	∑(3, 6, 15)
	U	∑(0, 2-4, 7-14)
	V	∑(0, 2-4, 8-10, 12-14)
	W	∑(1, 5, 6, 13)
	X	∑(0, 1, 3-5, 8, 10, 14)
	Y	∑(5, 13, 14)
	Z	∑(0, 1, 4, 5, 8, 14)
11	A1	--------
	A2	∑(2, 6)
	A3	∑(7-9)
	A4	--------
	A5	--------
	A6	∑(3, 4, 10)
	A	--------
	B	--------
	C	∑(3, 4, 7, 8, 10, 12)
	D	--------
	E	∑(2, 6)
	F	∑(2, 6)
	G	∑(0-2, 5-7)
	H	∑(0-2, 6)
	I	∑(0, 1, 3, 8-11)
	J	--------
	K	--------
	L	--------
	M	3, 8-11
	N	∑(0, 1, 4, 10-12)
	O	∑(5-7)
	P	∑(7-9)
	Q	∑(4, 10, 11)
	R	∑(0, 7-9)
	S	∑(7-9)
	T	∑(11, 12)
	U	∑(1, 2, 5-7, 12)
	V	∑(1, 2, 5-7, 15)
	W	∑(1, 3, 4, 8, 9, 11, 12)
	X	∑(3-5, 7-9, 11)
	Y	--------
	Z	∑(4, 5, 7-9)

D. Circuit Design

In Fig. 5, we showed that a 2 to 4 line decoder is connected to 4 blocks. According to the selection inputs of the decoder, a block will be activated. Every block is representing the logic circuit that can be achieved from the SOP function summarized in Table 7.

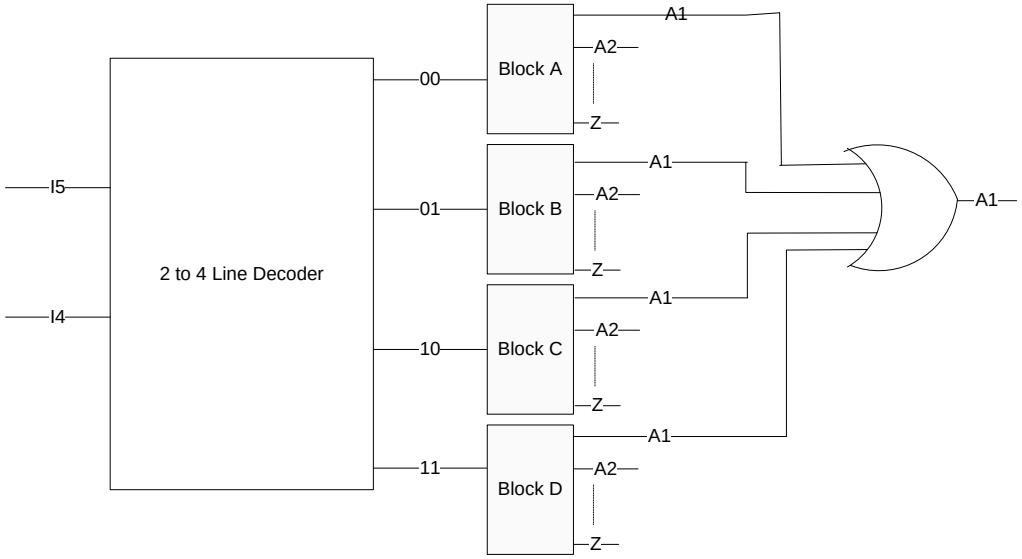

Figure 5. Block diagram of the circuit of the 32 segment display

IV. CONCLUSION

We approach to construct a 32 segment display design which is sustainable for practical use with flexibility, more compact than others and no redesign is necessary if we want to extend it. Our next effort will be to add the English numbers and characters so that in one display system it becomes possible to visualize both Bengali and English alphanumeric symbols. To add English characters and numbers, we need to use a 3 to 8 line decoder instead of 2 to 4 line decoder to keep the design unchangeable. We will need to add extra circuits only.

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