



**GOVERNMENT OF TAMILNADU**

**HIGHER SECONDARY FIRST YEAR**

# **COMPUTER SCIENCE**

**Untouchability is Inhuman and a Crime**

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**Department of School Education**

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## 2.7 Representing Characters in Memory

As represented in introduction, all the input data given to the computer should be in understandable format. In general, 26 uppercase letters, 26 lowercase letters, 0 to 9 digits and special characters are used in a computer, which is called character set. All these character set are denoted through numbers only. All Characters in the character set needs a common encoding system. There are several encoding systems used for computer. They are

- BCD – Binary Coded Decimal
- EBCDIC – Extended Binary Coded Decimal Interchange Code
- ASCII – American Standard Code for Information Interchange
- Unicode
- ISCII - Indian Standard Code for Information Interchange

### 2.7.1 Binary Coded Decimal (BCD)

This encoding system is not in the practice right now. This is  $2^6$  bit encoding system. This can handle  $2^6 = 64$  characters only.

### 2.7.2 American Standard Code for Information Interchange (ASCII)

This is the most popular encoding system recognized by United States. Most of the computers use this system. Remember this encoding system can handle English characters only. This can handle  $2^7$  bit which means 128 characters.

In this system, each character has individual number (Refer **Appendix**).

The new edition (version) ASCII -8, has  $2^8$  bits and can handle 256 characters are represented from 0 to 255 unique numbers.

The ASCII code equivalent to the uppercase letter 'A' is 65. The binary representation of ASCII (7 bit) value is 1000001. Also 01000001 in ASCII-8 bit.

### 2.7.3 Extended Binary Coded Decimal Interchange Code (EBCDIC)

This is similar to ASCII Code with 8 bit representation. This coding system is formulated by International Business Machine(IBM). The coding system can handle 256 characters. The input code in ASCII can be converted to EBCDIC system and vice - versa.

### 2.7.4 Indian Standard Code for Information Interchange (ISCII)

ISCII is the system of handling the character of Indian local languages. This as a 8-bit coding system. Therefore it can handle  $2^8$  characters. This system is formulated by the department of Electronics in India in the year 1986-88 and recognized by Bureau of Indian Standards (BIS). Now this coding system is integrated with Unicode.

### 2.7.5 Unicode

This coding system is used in most of the modern computers. The popular coding scheme after ASCII is Unicode. ASCII can represent only 256 characters. Therefore English and European Languages alone can be handled by ASCII. Particularly there was a situation, when the languages like Tamil, Malayalam, Kannada and Telugu could not be represented by ASCII. Hence, the Unicode was generated to handle all the coding system of Universal languages. This is 16 bit code and can handle 65536 characters.

Unicode scheme is denoted by hexadecimal numbers. The Unicode table of Tamil, Malayalam, Telugu and Kannada is shown in Table 2.6

Table 2.6

Unicode Table of Tamil								Unicode Table of Malayalam									
	0B8	0B9	0BA	0BB	0BC	0BD	0BE	0BF		0D0	0D1	0D2	0D3	0D4	0D5	0D6	0D7
0		ஐ 0B90		ர 0BB0	ீ 0BC0	ஓ 0BD0		ய 0BF0	0	ஃ 0D00	ஐ 0D10	ஓ 0D20	ஔ 0D30	ஐ 0D40		ஐ 0D60	ஐ 0D70
1				ற 0BB1	ு 0BC1			ள 0BF1	1	ஃ 0D01		ஔ 0D21	க 0D31	஖ 0D41		ஐ 0D61	ஐ 0D71
2	ஃ 0B82	ஓ 0B92		ல 0BB2	ு 0BC2			த 0BF2	2	ஃ 0D02	ஓ 0D12	ஔ 0D22	க 0D32	஖ 0D42		ஐ 0D62	ஐ 0D72
3	ஃ 0B83	ஓ 0B93	ண 0BA3	ள 0BB3				உ 0BF3	3	ஃ 0D03	ஓ 0D13	ஔ 0D23	க 0D33	஖ 0D43		ஐ 0D63	ஐ 0D73
4		ஓள 0B94	த 0BA4	ழ 0BB4				ம் 0BF4	4		ஓ 0D14	ஔ 0D24	க 0D34	஖ 0D44	஗ 0D54		ஐ 0D74
5	அ 0B85	க 0B95		வ 0BB5				ஹ 0BF5	5	ஓ 0D05	ஔ 0D15	க 0D25	஖ 0D35	஗ 0D45	஘ 0D55		ஐ 0D75
6	ஆ 0B86			ஶ 0BB6	ெ 0BC6		ஓ 0BE6	பு 0BF6	6	ஓ 0D06	ஔ 0D16	க 0D26	஖ 0D36	஗ 0D46	஘ 0D56	ங 0D66	ஐ 0D76
7	இ 0B87			ஷ 0BB7	ே 0BC7	ள 0BD7	க 0BE7	ஔ 0BF7	7	ஓ 0D07	ஔ 0D17	க 0D27	஖ 0D37	஗ 0D47	஘ 0D57	ங 0D67	ஐ 0D77
8	ஈ 0B88		ந 0BA8	ஸ 0BB8	ை 0BC8		உ 0BE8	ஹை 0BF8	8	ஓ 0D08	ஔ 0D18	க 0D28	஖ 0D38	஗ 0D48	஘ 0D58	ங 0D68	ஐ 0D78
9	உ 0B89	ங 0B99	ன 0BA9	ஹ 0BB9			ங 0BE9	ஹ 0BF9	9	ஓ 0D09	ஔ 0D19	க 0D29	஖ 0D39	஗ 0D49	஘ 0D59	ங 0D69	ஐ 0D79
A	ஊ 0B8A	ச 0B9A	ப 0BAA		ொ 0BCA		சு 0BEA	ஹீ 0BFA	A	ஓ 0D0A	ஔ 0D1A	க 0D2A	஖ 0D3A	஗ 0D4A	஘ 0D5A	ங 0D6A	ஐ 0D7A
B					ோ 0BCB		ஹ 0BEB		B	ஓ 0D0B	ஔ 0D1B	க 0D2B	஖ 0D3B	஗ 0D4B	஘ 0D5B	ங 0D6B	ஐ 0D7B
C		ஐ 0B9C			ெள 0BCC		ஹ 0BEC		C	ஓ 0D0C	ஔ 0D1C	க 0D2C	஖ 0D3C	஗ 0D4C	஘ 0D5C	ங 0D6C	ஐ 0D7C
D					ஃ 0BCD		எ 0BED		D		ஔ 0D1D	க 0D2D	஖ 0D3D	஗ 0D4D	஘ 0D5D	ங 0D6D	ஐ 0D7D
E	எ 0B8E	ஞ 0B9E	ம 0BAE	ா 0BBE			அ 0BEE		E	ஓ 0D0E	ஔ 0D1E	க 0D2E	஖ 0D3E	஗ 0D4E	஘ 0D5E	ங 0D6E	ஐ 0D7E
F	ஏ 0B8F	ழ 0B9F	ய 0BAF	ி 0BBF			ஹ 0BEF		F	ஓ 0D0F	ஔ 0D1F	க 0D2F	஖ 0D3F	஗ 0D4F	஘ 0D5F	ங 0D6F	ஐ 0D7F

Table 2.6

Unicode Table of Telugu								Unicode Table of Kannada									
	0C0	0C1	0C2	0C3	0C4	0C5	0C6	0C7		0C8	0C9	0CA	0CB	0CC	0CD	0CE	0CF
0	ం	ఱ	ఱ	ఱ	ఱ		ఱ		0	ం	ఱ	ఱ	ఱ	ఱ		ఱ	
1	ం		ఱ	ఱ	ఱ		ఱ		1	ం		ఱ	ఱ	ఱ		ఱ	ఱ
2	ం	ఱ	ఱ	ఱ	ఱ		ఱ		2	ం	ఱ	ఱ	ఱ	ఱ		ఱ	ఱ
3	ం	ఱ	ఱ	ఱ	ఱ		ఱ		3	ం	ఱ	ఱ	ఱ	ఱ		ఱ	
4		ఱ	ఱ	ఱ	ఱ				4		ఱ	ఱ		ఱ			
5	ఱ	ఱ	ఱ	ఱ		ఱ			5	ఱ	ఱ	ఱ	ఱ	ఱ			
6	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ		6	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	
7	ఱ	ఱ	ఱ	ఱ	ఱ		ఱ		7	ఱ	ఱ	ఱ	ఱ	ఱ		ఱ	
8	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	ఱ	8	ఱ	ఱ	ఱ	ఱ	ఱ		ఱ	
9	ఱ	ఱ		ఱ		ఱ	ఱ	ఱ	9	ఱ	ఱ		ఱ			ఱ	
A	ఱ	ఱ	ఱ		ఱ	ఱ	ఱ	ఱ	A	ఱ	ఱ	ఱ		ఱ		ఱ	
B	ఱ	ఱ	ఱ		ఱ		ఱ	ఱ	B	ఱ	ఱ	ఱ		ఱ		ఱ	
C	ఱ	ఱ	ఱ		ఱ		ఱ	ఱ	C	ఱ	ఱ	ఱ	ఱ	ఱ		ఱ	
D		ఱ	ఱ	ఱ	ఱ		ఱ	ఱ	D		ఱ	ఱ	ఱ	ఱ		ఱ	
E	ఱ	ఱ	ఱ	ఱ			ఱ	ఱ	E	ఱ	ఱ	ఱ	ఱ		ఱ	ఱ	
F	ఱ	ఱ	ఱ	ఱ			ఱ	ఱ	F	ఱ	ఱ	ఱ	ఱ			ఱ	

Appendix  
American Standard Code for Information Interchange (ASCII)  
(Few specific characters only)

### Alphabets

Alphabets	Decimal number	Binary number (8 bit)	Octal number	Hexadecimal number
A	65	01000001	101	41
B	66	01000010	102	42
C	67	01000011	103	43
D	68	01000100	104	44
E	69	01000101	105	45
F	70	01000110	106	46
G	71	01000111	107	47
H	72	01001000	110	48
I	73	01001001	111	49
J	74	01001010	112	4A
K	75	01001011	113	4B
L	76	01001100	114	4C
M	77	01001101	115	4D
N	78	01001110	116	4E
O	79	01001111	117	4F
P	80	01010000	120	50
Q	81	01010001	121	51
R	82	01010010	122	52
S	83	01010011	123	53
T	84	01010100	124	54
U	85	01010101	125	55
V	86	01010110	126	56
W	87	01010111	127	57
X	88	01011000	130	58
Y	89	01011001	131	59
Z	90	01011010	132	5A
a	97	01100001	141	61
b	98	01100010	142	62
c	99	01100011	143	63
d	100	01100100	144	64
e	101	01100101	145	65

f	102	01100110	146	66
g	103	01100111	147	67
h	104	01101000	150	68
i	105	01101001	151	69
j	106	01101010	152	6A
k	107	01101011	153	6B
l	108	01101100	154	6C
m	109	01101101	155	6D
n	110	01101110	156	6E
o	111	01101111	157	6F
p	112	01110000	160	70
q	113	01110001	161	71
r	114	01110010	162	72
s	115	01110011	163	73
t	116	01110100	164	74
u	117	01110101	165	75
v	118	01110110	166	76
w	119	01110111	167	77
x	120	01111000	170	78
y	121	01111001	171	79
z	122	01111010	172	7A

## Numerals

Alphabets	Decimal number	Binary number (8 bit)	Octal number	Hexadecimal number
0	48	00110000	60	30
1	49	00110001	61	31
2	50	00110010	62	32
3	51	00110011	63	33
4	52	00110100	64	34
5	53	00110101	65	35
6	54	00110110	66	36
7	55	00110111	67	37
8	56	00111000	70	38
9	57	00111001	71	39

## Special Characters

Special symbols	Decimal number	Binary number (8 bit)	Octal number	Hexadecimal number
Blank	32	00100000	40	20
!	33	00100001	41	21
"	34	00100010	42	22
#	35	00100011	43	23
\$	36	00100100	44	24
%	37	00100101	45	25
&	38	00100110	46	26
'	39	00100111	47	27
(	40	00101000	50	28
)	41	00101001	51	29
*	42	00101010	52	2A
+	43	00101011	53	2B
,	44	00101100	54	2C
-	45	00101101	55	2D
.	46	00101110	56	2E
/	47	00101111	57	2F
:	58	00111010	72	3A
;	59	00111011	73	3B
<	60	00111100	74	3C
=	61	00111101	75	3D
>	62	00111110	76	3E
?	63	00111111	77	3F
@	64	01000000	100	40
[	91	01011011	133	5B
\	92	01011100	134	5C
]	93	01011101	135	5D
^	94	01011110	136	5E
_	95	01011111	137	5F
`	96	01100000	140	60
{	123	01111011	173	7B
	124	01111100	174	7C
}	125	01111101	175	7D
~	126	01111110	176	7E



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