Decoders

& Decoder takes

n ilps and

uses

thore *ilps* to determine

which of

the

lines is

2

bigh

жед

ég

1 to 2

decoder

2:

: 4

decoder

3:8

decoder

n

A decoder provides 2

minterns

#

of

n

ijp variables.

ж би

n.

Ю

M

decoder（nim)

m ≤ 2

1 – do -2

n

decoder

(1:2)

to Do Di

0

До

1:2

0

decoder

Do

D

-ilps

A

Ao

=0

olps

2:4 decoder

öl

1,0

Do D, D2 D3

○○

OO

0

○○

J

1

O

ﾝ

10

D

○

1

3

O

0 0

o

1 =

Doz

D1=0,1

ə

A

الوا

ฉ

do do

Do= d, do

DIEÁTAO

D

D2

D3

3:8 decoder

Az A, Ao Do D, D2 D3 D4 D5 Do Dz

oo

0

o

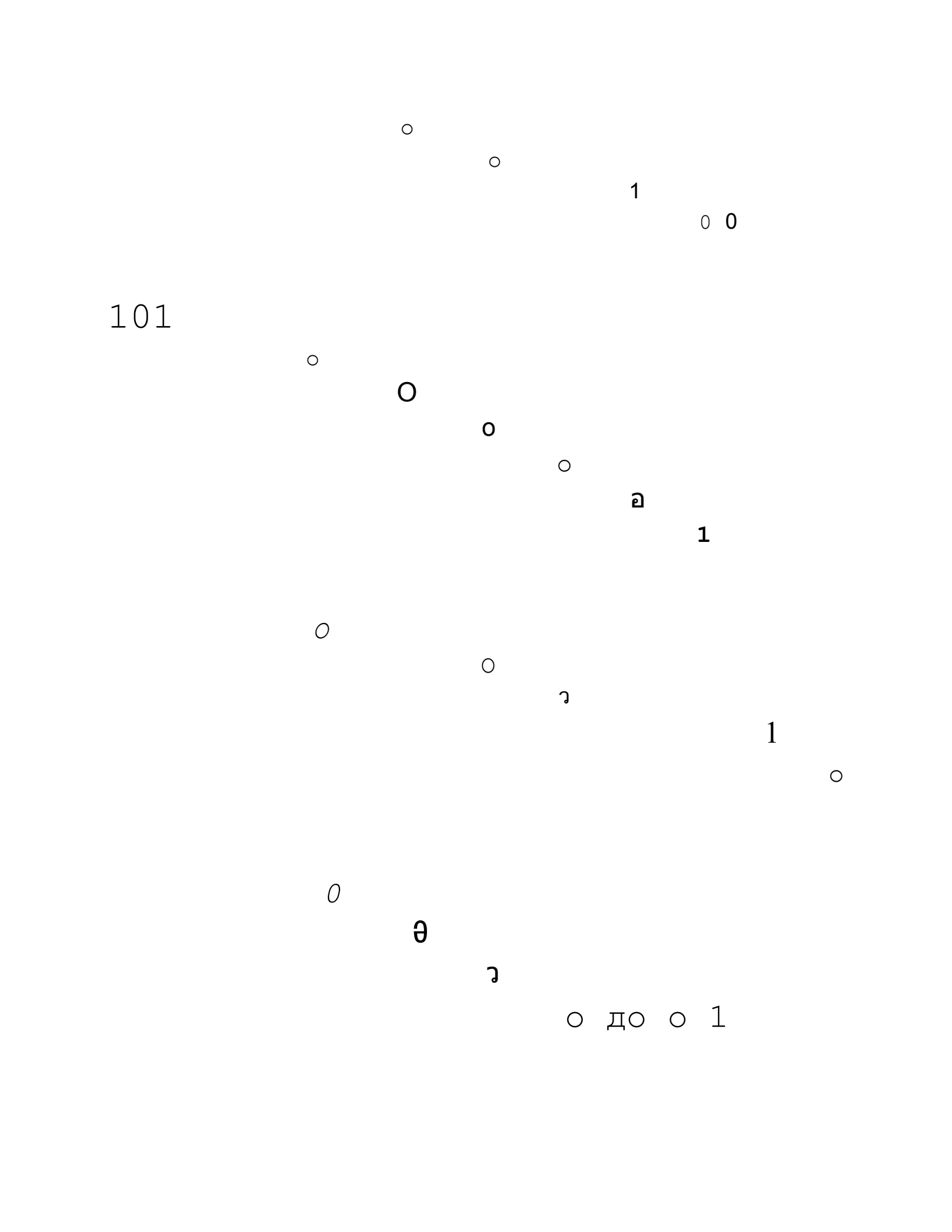
o

ว

o

o

o
0
1
O
๒ ๒
O
o
0
O
oo
๑
O
o
1
O
O
๑
op
100
o



A2

الو

do

1

3:8

2

decoder

3

4-

5

6

D) Realize the following Boolean expressions using 3-b5-8 decoder and external gates.

F, (A, B, C)= {m
(0,4,6)
F2 (A,B,C) = {m
(0,5);
F3 (A, B, C) = {M(1,
2, 3, 7)

so!"; F; (A, B, C) =
ĀBET ABéTABE

1
4
6

A-

B

C

3"

Yo

y

1/2

y

L

A B C

AB

ARC

F

チュ

F
3

14

2） Using

a decoder and

external galés, design the combinational ckt. defined by

the following three Boolean femr ctions.

узіну

F1 = x'y'}' +xz; F2 = xys+x'y; F3=aystay

たが計れる

F2

F1 = x y z + xz (y+y'))

= x'y'}'+ xyz + xy

z

อ

7

5

{(0,5,7

)

1

$$82 =$$

$$\text{xy'}\}'+\text{xy}(3+3)=\mathbf{xyz'}+n$$

$$y \;\; \text{z} + \text{xyz'}$$

100 011 010

$$= \{(4,3,2)$$

z

F3 = x y z + xy(3+ z) = x2 y z + xyz + xy?

1 o

001 17 1 110

= {(1, 7, 6)

Σ

1

x'y'z1

Y

F

F2

w

y

3:8

}

нук

F3

3-8 line decoder IC 74138

do

1

-Vec

16

F1 =

(0,5)

= déA/Act

44/4

الله

(MSB)

A (nd)

GZA

(nd)GZ

B (Vac)

G1

Y7

gud.

15

14 by

130Y2

12

уз

2

4

3

opat

4

1

3

5

ساله

1

11

3**:3**

10

Y5

ว

Y

-Y4

رة

F

(14, do)

A2A, **A**;

101

Az A, A

D

Az **dido**

=

(AMA

(NO) int

(dzajαo)

3:8

– {) + ( )

* 74138, 2-8 decoder accepts 3 kinary weighted i/ps (dz, d1, do and when enabled provides 8 mutually exclusive active *low* o/ps.

3) Design FA and FS using 74138 IC

FA.

s = {m (1, 2,

4,7) Cout={m

(3, 5, 6, 7)

Az A, Ao

a b c **in**

cin

م

A

7

ь

Cin

A

До

سائل

77

S

Cout

Design FS eving 3:8 decoder

(74138)

L Assignment

4) Construct 3:8 decoder using 1:2 and 2:4 decoders.

Jo1"-

9

3:8

ilps

solps

2:42

Gopps

الات

YouX

1:2

12:4

ש א

Do

DI

D3

A2

Y1

Dy

-D5

A2A, **Ao** Do **D1**

D2

.DF

22:4

D

-DY

660

100

001 010

01

-0

0 10

001

D

101

1

1

o

1 1 1

ooo-

5)

Construct

a 4 to 16 live decoder

with five 2−to-4 line decoders

with enable.

soln

ر ل

4:16

A。

A

do

تما

Do-71

5

A

Аз

2:45

اللمس

2:4 decoders

2:4

opps 417

418

Do

20

2:4 decodey

·D2

D3

24

2:4

ì

2

E

D7

D8

1

2:4

E

}

Dil

D12

D

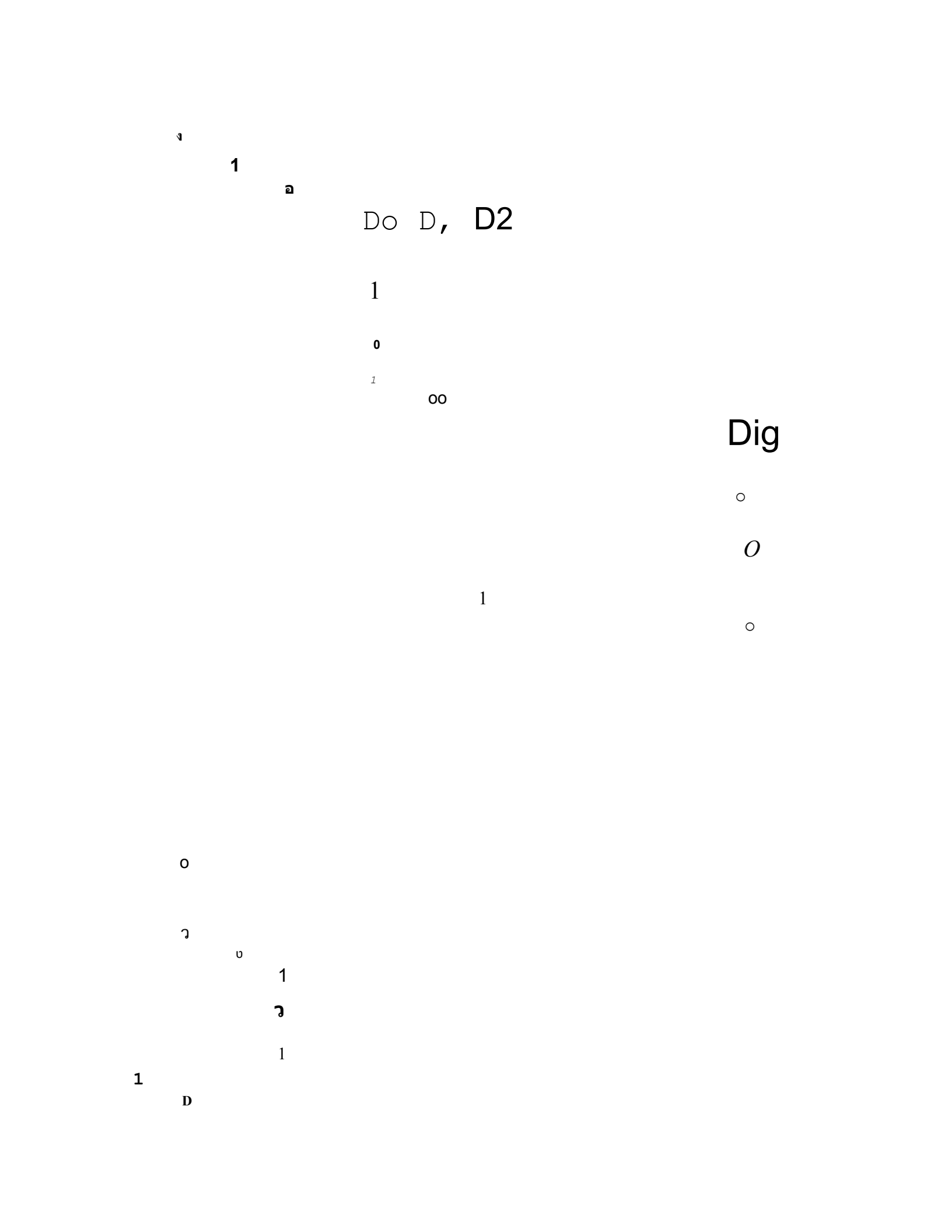
2:4

2 E

D15

Az Az A, do

D


Do D, D2
Dig

1

อ

ย

1

1

O

1

1

0

0

1

6） construct

with

with

- op

a

1

5-20-32 line decoder

3-6-8 and 2:4 line decoders. enable itp. Use block digram for compone nts.

soln:-

به

روار

ilps

4;

to

5:32

ملور رلو

ㄴ 32

32 = 4 →→ 3:8

decoders

select one

among

among 4 ure

1,3:4

decoder

Do

3 : 8

3 : 8

%

A3

X

2:4

-Dis

3:8

Ан

E

-D23

Day

3:8

·D31

a 2:4

7） Drow the logic diagram of

line decoder using (a) NAND gate's *only* （6） NOR gates only . Include enable i/p.

soln

2:4

↓

ما

E **A**, do

0/0

Do AADE

E

か

DI MADE E

A, ADE

Do

베스트 미 2:4E D2

8, AE

Dz

P3

0 D2 A, **46E**

a) NAND only

Dz AIAGE

A,'

و رابو

E **الملو** ao

do

6) NOR only

(A1'A '€)

A

AAE

व्

切

A, 16€

اور او OE

z

2 +E=A5E

Ait A1+ do + E

= 1, * €

Do

soo 글

A, AGE → *d1* + A+E =DIA, ADE →

A,+ dotĒ

A,ADE =>

A1 +

A2+E=D3

FD

A

ə

E

D1 = &, d

E

か

D2 = 1, *E

8)

Design

водое

D2 = ADADE

D3

BCD to decimal decoder

using the unused

combinations

of BCD code as don't care

condo

tions.

0-9 -TO OT

sol" - The design can be simplified

by considering 10 olp with o

don't care conditions ie,

6

fm BCD {m (0,1,2, 3 - -9) + dc (10, 11--15)

ملا

O

oo

0

1

2

21

1

3

A B C D

Decimal

CD

00

OO DO

21

AB

ㅣㅏ

ㅓㅐ

DI D3 RZ

o

100

ϥ

0104 DS

57D6

0

101

○

10

11XX

IXVILX

○

1

○○○

8

1

○○

1010

1

ɔ

1

oo

10

xxxxx

008

Do = A'B'C'D'

D6=BCD

A'B'C

'D

DI = *wet*' B'

C'D

D7=BCD

D2= B'CD! D8

=AD'

10 D8 D9XNX

D3= BCD

D9=AD

D4 = B C

D2

c

A

B C D

D5 = BCD

Do

1

}

.D9

Magnistude Comparator

» It is a combinational ckt. That

пов

compares tuo nos., A YB,

and

determines their relative magnitude

The outcome of comparison is speci -fied by three binary variables that indicate whether d=B, *<B or ASB.

1-bit comparator

* Let the two 1-bit ilps be AXB .

The

Y if AB X Z if A7B

y

x = *AB!*

o/ps

are x if f=B

A

B

X Y Z

G

oo

oo

1

10 1 จ

ม

2

10

A'B' +AB=

ARB

Y = $x'B$

31 لو

3

○○

A

B

D

2–bit comparator

Ал

1

2

B. Bo / xy

1

x =

Á Œ B

Y = A'B

= AB'

ƨ

Я

A

B

Z

Ao

B, Bo

○○

O

ก

ร

o

2

0010

o

1

3

0011

o 1

อ

i/ps

x if 1, d=

B,Bu

4

01

oo

5

0

110 1

01

1

∞

y if di dot

B, Bo

6

1

10

0

10

Z

○

1

O

1

○

if A,

No>B, Bo

8

1

0100

ʔ

10

11

|2

ʊ

01

pe

○○

01

งว

10

○

I

011

o

ן

浩

1

0

0

จ

1 0

o

ep

1 0

x= {m (0,5, 10, 15)

Y = {m(1,2,3,6,7,11) z = {m (4, 8, 9, 12, 13, 14)

дво

B, B

00

21

ou

Do 1

01

1/ 10

2

⇒

B'ot

AÓB, Bót A,
A, B, Bot

11

12

13

14

10

8

·B

7

A, A, B, B2+
A, A, B, B1

(doBot
Mobo)+

```
                                    4, B1 (d, B2+
                                    Ao`B'1)

  => 1, 'B, (No +
  Bo) + 1, 8, (Not
  Bo)
            (*
            %
  =) (do + Bo) (A,
  B,' + &, B1)
X =>
```

Not Bo)

(s

A, дв

x =

хох 1

Но

X2 = Ao → B2,

X1 = A, @B

3-bit comparator

X = X2-x, · x2 => (4,000)

(1,8,) (101)

X

4-61t

D

B

x=

{(1,2,3,6,7,

"1)

AB.B

קוו

ro

01

10

00

2

o]

4

5

12

13

15

14.

10

e

$$Y = A, B,1 + A,$$

$$A, B2 + A, B, B$$

X

=

A

[OR]

)

o

B, + A, A, B, BO +

A, do B, Bo

大

A, B, + A, B2

(A, B + A,

B1)

B

o

A, B, + AB2

(A,

Bol

し

B,1

)

(bit)

(2414) Y =

A,B,+ ABOX,

(:x,

=

(`: x1 =

A, B,

Box

1

(3-bit) Y = A2 B12+

A, B, X 2 + A By X

2X;

2

(4-bit) y= A3 Bz + Ay B2&

37 A, B,239,2+ ==&="3"}},

2

Z

{(4, 8, 9, 12,

13,14)

B.Bo

Ado

00.01

11

10

e

00

0

3

2

01

7

11

13

15

14

|O

4

10

Bi

+

== A, Bit AB, Bó +

A, A, B.

Z = A, B,

+

z

[OR

]

| A & B, B'1+

A, A, B, Bo

Bot

1

= A, B, + B6

(A, B, + *, B1)

い

=

11

t dobó

A, B,+ A2 B1

(*A*, B1)

Ao Bó

A

A, B,+ dobó x,

(2-bit)

2 = α2 82+4,8 ×2 +

A2Box2x, *(3-bid)*

z

2 =

2

A, B,

길

As B3 + A2B2X3+ A, B, X322 + 4 Boxxx (4-617)