Daffodil International University

Faculty of Science & Information Technology (FSIT)

Department of Software Engineering

Midterm Examination, Summer 2025

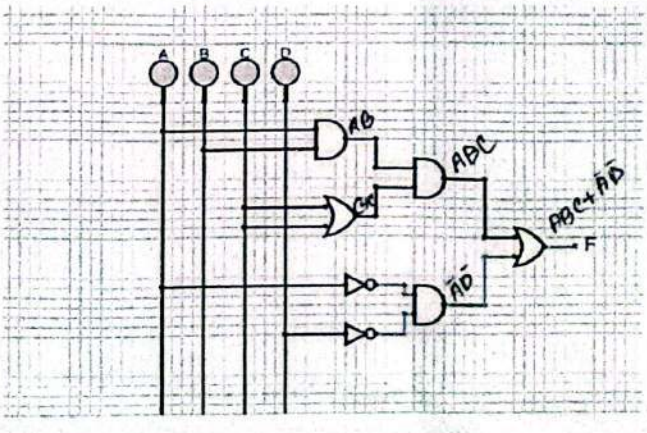
Course Code: SE 213; Course Title: Digital Electronics and Logic Design

Sections & Teachers: SP, HI, MTE, NAN, SAN SHN
Batch and Section: 43 (A to O)

Time: 1 Hour 30 Mins **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	**Subtract** the following using 2's complement: i) $(17)_{10}$-$(63)_{10}$ ii) $(101100)_2$-$(1011)_2$	[Marks-3+2]	CLO-1 *Level-2*
	b)	Check the following circuit diagram. **Express** the output logic equation and simplify it: 	[Marks-5]	
2.	*a)*	i) **Construct** the Full Adder circuit using basic logic gates. ii) **Apply** Parallel adder to compute (X+ Y) along with diagram: Where X =1 0 1 1 and Y = 1 1 0 0	[Marks-5+2]	CLO-2 *Level-3*
	b)	F (A, B, C, D) = (A+B) (C'+D) +A·C Apply k-map simplification technique to simplify the above expressions. **Construct** the logic diagrams of the simplified output.	[Marks-8]	

Digital electronics and logic design

Summer-25

Question 1:

(i) $(17)_{10} - (63)_{10}$

$\therefore 17 \rightarrow 0001001$

$63 \rightarrow 00111111$

Now:

$17 + (-63)$

$\Rightarrow$ 00010001
+ 11000001
11010010

1's complement of 63
$\rightarrow$ 11000000
+1
11000001 ← 2's complement

Here 11010010 is negative.
As MSB = 1. To find magnitude
→ 1's complement = 00101101
→ 2's complement => 00101110
→ Result = -46

(ii) $(101100)_2 - (1011)_2$

Lets work in a 6 bit system.

101100
001011 → 1's complement :: 110100 → 2's compl. :: 110101

∴ Now,

101100
+ 110101 ⇒ 100001
100001
↳ carry

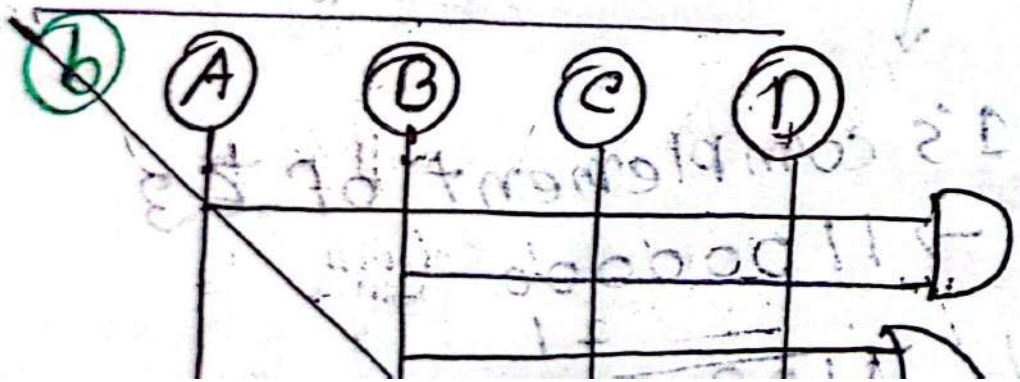
MSB = 1; Negative?

Verify:

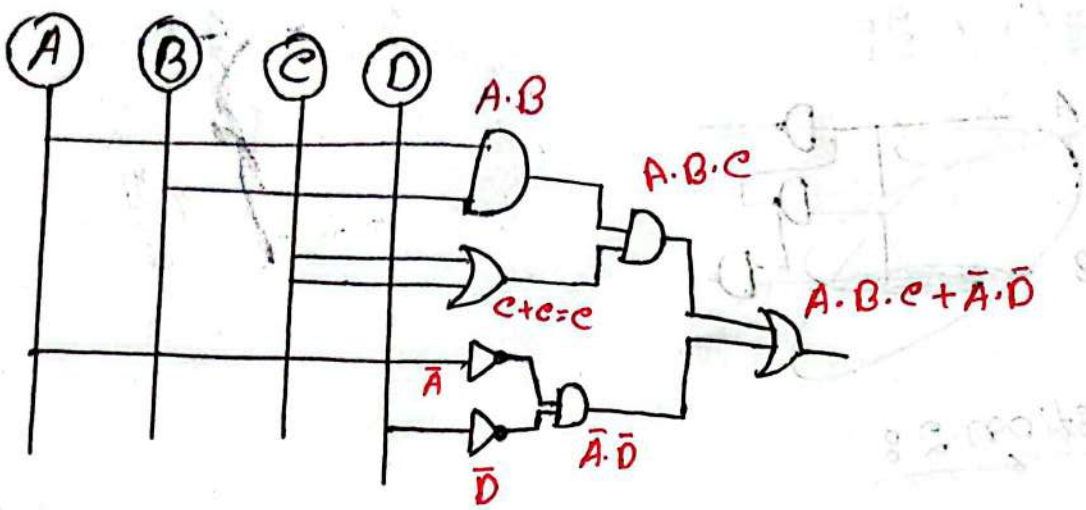
$1011.00_2 = 44_{10}$ -> 44 - 11 = 33

$0010\,11_2 = 11_{10}$

=> So no need for 2's complementing again as the result is Positive.



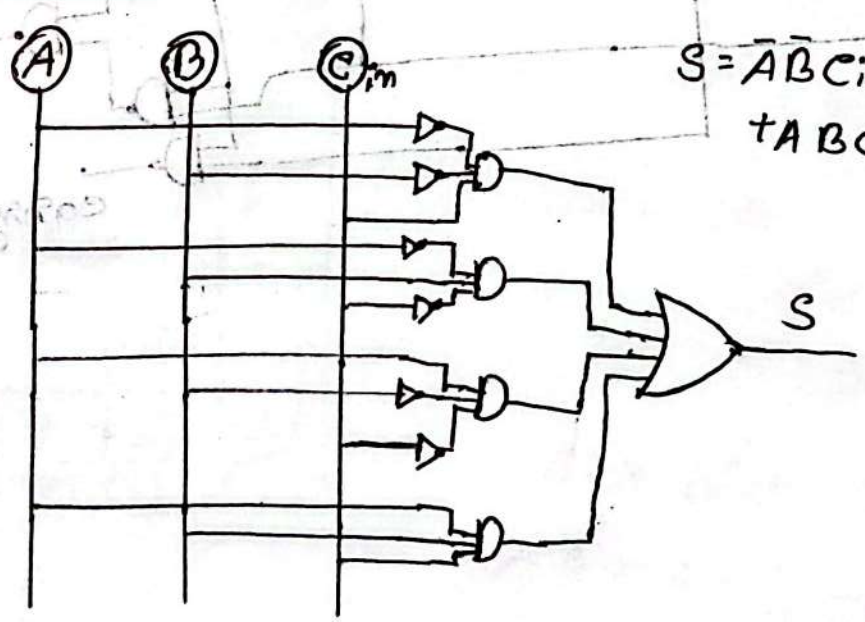
(b)



The most simplified output is => $ABC + \bar{A}\bar{D}$

Question 2:

(a)

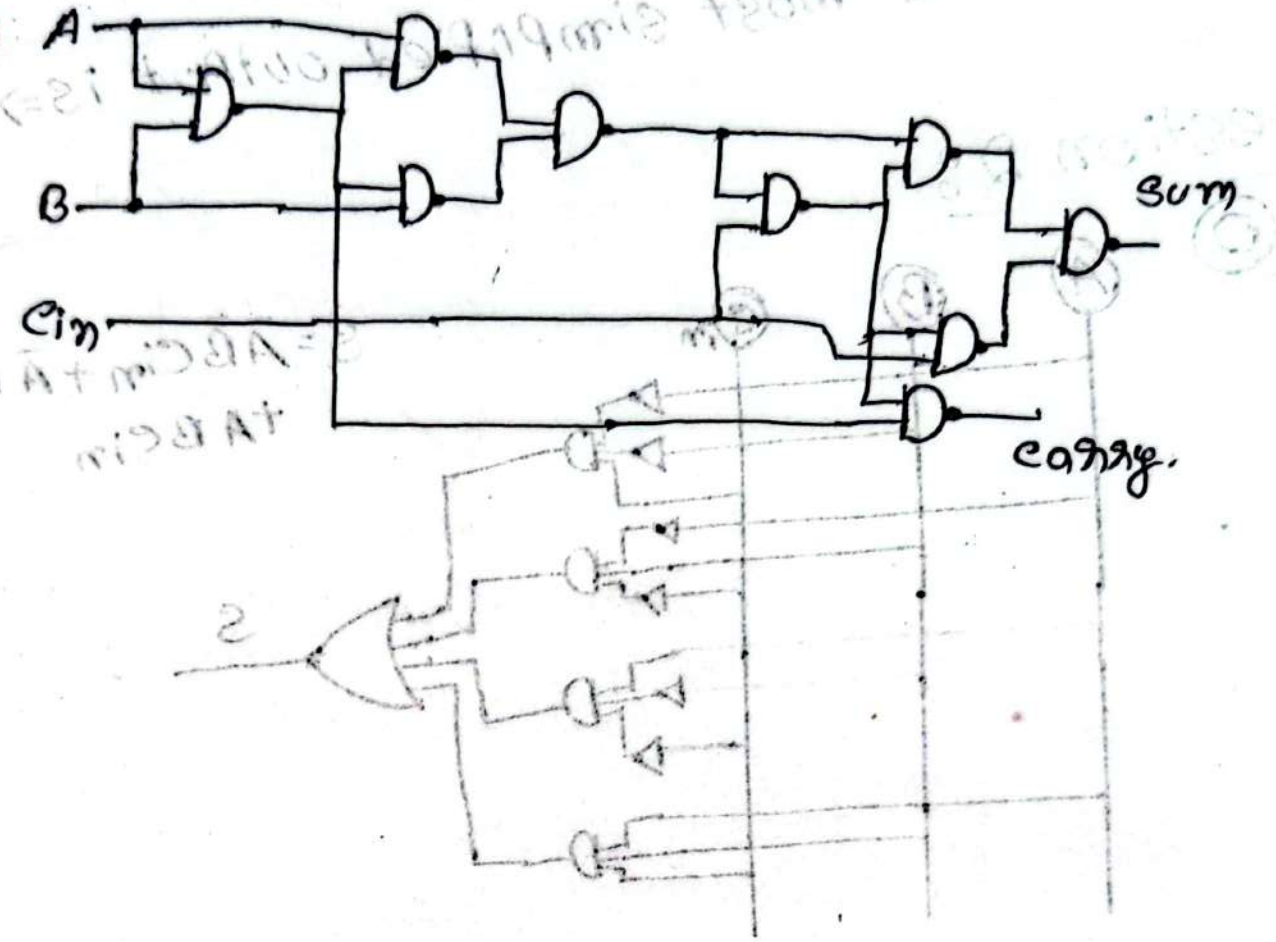


$S = \bar{A}\bar{B}C_{in} + \bar{A}B\bar{C}_{in} + A\bar{B}\bar{C}_{in} + ABC_{in}$

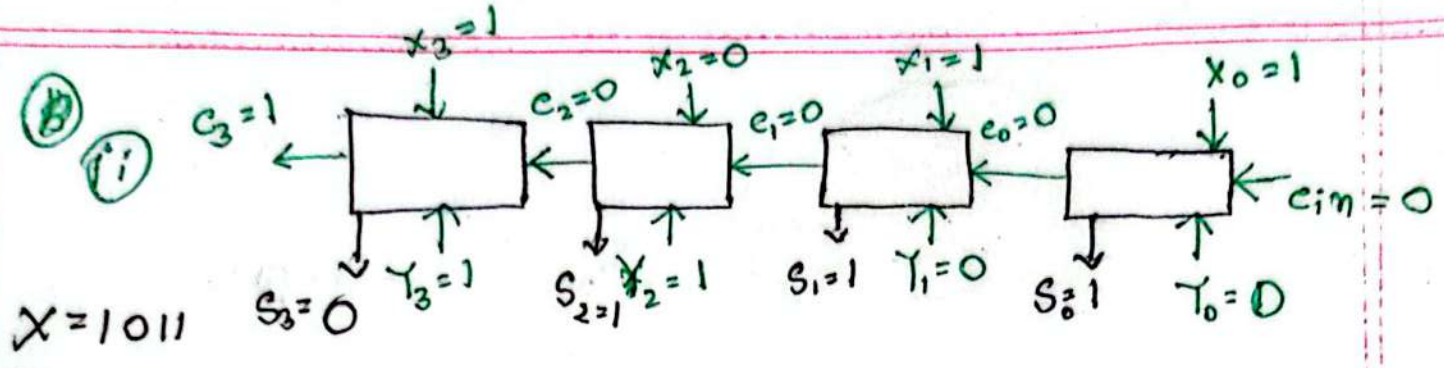
Question 2:

(a)

(i)



(a) (i)



$X = 1011$

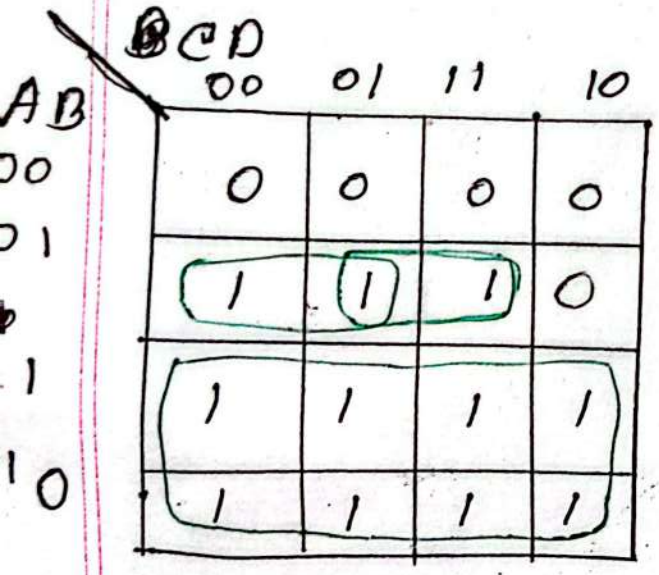
$Y = 1100$

~~$S =$~~ $S = 1\ 0\ 1\ 1\ 1$

↳ carry bit.

(b) $F(A,B,C,D) = (A+B)(C'+D)+A\cdot C$

$= AC' + AD + BC' + BD + AC$



min terms: (4, 5, 7, 8, 9, 10, 12, 13, 14, 15)

GROUP 1: A

" 2: $A'BC'$

" 3: $A'BD$

$A + A'BC' + A'BD$

$\Rightarrow A + A'B(C'+D)$

$\Rightarrow A + B(C'+D)$