

처음 만나는 디지털 논리회로

제05장 불 대수

기출문제 풀이

01. 논리식 중 성립되지 않는 것은?

① $A \cdot A = A$

② $A = \overline{\overline{A}}$

③ $A + \overline{A} = A$

④ $A \cdot \overline{A} = 0$

③ $A + \overline{A} = 1$

02. 다음 논리식에서 옳지 않은 것은?

① $A + A = A$

② $A \cdot A = A$

③ $A + \overline{A} = 1$

④ $A \cdot \overline{A} = 1$

④ $A \cdot \overline{A} = 0$

03. 다음 논리식 중 옳은 것은?

① $A + \bar{A} = A$

② $A + \bar{A} = 0$

③ $A + \bar{A} = 1$

④ $A + \bar{A} = \bar{A}$

③ $A + \bar{A} = 1$

04. 불 대수식 중 옳지 않은 것은?

① $A \cdot 1 = A$

② $A + 1 = 1$

③ $A \cdot \bar{A} = 0$

④ $A + \bar{A} = 0$

④ $A + \bar{A} = 1$

05. 다음 논리식 중 틀린 것은?

① $A + 0 = A$

② $A \cdot 0 = 0$

③ $A \cdot 1 = 1$

④ $A + 1 = 1$

③ $A \cdot 1 = A$

06. 불 대수(Boolean algebra)가 옳지 않은 것은?

① $A + \overline{A}B = A$

② $A \cdot A = A$

③ $A + A\overline{B} = A$

④ $A(A + B) = A$

$$\begin{aligned} \text{① } A + \overline{A}B &= A(\overline{B} + B) + \overline{A}B = A\overline{B} + AB + \overline{A}B \\ &= A\overline{B} + AB + \overline{A}B + AB = A(\overline{B} + B) + (\overline{A} + A)B = A + B \end{aligned}$$

$$\text{③ } A + A\overline{B} = A(1 + \overline{B}) = A \cdot 1 = A$$

$$\text{④ } A(A + B) = AA + AB = A + AB = A(1 + B) = A \cdot 1 = A$$

07. 불 대수에 관한 정리 중 옳지 않은 것은?

① $A + A = A$

② $A\bar{A} = 0$

③ $A + AB = A$

④ $A + \overline{AB} = A + B$

③ $A + AB = A(1 + B) = A \cdot 1 = A$

④ $A + \overline{AB} = A + \bar{A} + \bar{B} = 1 + \bar{B} = 1$

08. 다음 중 불 대수 정리로 옳지 않은 것은?

① $B + \bar{B} = 1$

② $AB + A\bar{B} = B$

③ $(A + B)(A + \bar{B}) = A$

④ $A(\bar{A} + B) = AB$

② $AB + A\bar{B} = A(B + \bar{B}) = A \cdot 1 = A$

③ $(A + B)(A + \bar{B}) = AA + A\bar{B} + AB + B\bar{B} = A + A\bar{B} + AB = A(1 + \bar{B} + B) = A \cdot 1 = A$

④ $A(\bar{A} + B) = A\bar{A} + AB = 0 + AB = AB$

09. 불 대수의 법칙에 어긋나는 것은?

① $\overline{AB} + A\overline{B} = A + B$

② $A + AB = A$

③ $A + \overline{AB} = A + B$

④ $(A + B) \cdot (A + C) = A + B \cdot C$

① $\overline{AB} + A\overline{B} = A \oplus B$

10. 불 대수의 정리 중 옳지 않은 것은?

① $A + B = B + A$

② $A + B \cdot C = (A + B)(A + C)$

③ $A + \overline{A} = 1$

④ $A \cdot B = \overline{\overline{A} + \overline{B}}$

④ $\overline{\overline{A} + \overline{B}} = \overline{A} \cdot \overline{B}$

11. 다음 중 불 대수가 옳지 않은 것은?

① $A + \overline{A}B = A + B$

② $A(\overline{A} + B) = AB$

③ $A + AB = A$

④ $A + A = 1$

④ $A + A = A$

12. 다음 불 대수의 정리 중 틀린 것은?

① $x(x + y) = y$

② $\overline{x + y} = \overline{x} \cdot \overline{y}$

③ $x + yz = (x + y)(x + z)$

④ $x + xy = x$

① $x(x + y) = xx + xy = x + xy = x(1 + y) = x$

13. 불 대수의 정리 중에서 옳지 않은 것은?

① $C + C \cdot B = C$

② $A \cdot (A + B) = A$

③ $A + AB + AD = A$

④ $A \cdot (A + AB) = A + B$

④ $A \cdot (A + AB) = A(A(1 + B)) = A(A \cdot 1) = A$

14. 불 대수의 정리 중 옳지 않은 것은?

① $\overline{A \cdot B} = \overline{A} + \overline{B}$

② $A \cdot (A + B) = A$

③ $A + \overline{A}B = A + B$

④ $A(\overline{A} + AB) = A + B$

④ $A(\overline{A} + AB) = A\overline{A} + AAB = 0 + AB = AB$

15. 다음 불 함수 중 그 결과값이 항상 1인 것은?

- ① $x + x$ ② $x \cdot x$
 ③ $x + 1$ ④ $x \cdot 0$

- ① $x + x = x$ ② $x \cdot x = x$
 ③ $x + 1 = 1$ ④ $x \cdot 0 = 0$

16. 다음 불 대수의 정리는?

$$(A + B)(A + C) = A + BC$$

- ① 결합 법칙 ② 분배 법칙
 ③ 교환 법칙 ④ 흡수 법칙

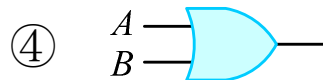
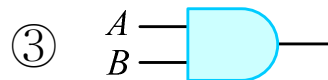
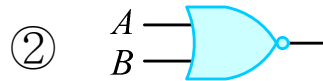
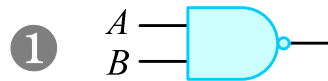
분배법칙 : $A \cdot (B + C) = A \cdot B + A \cdot C$ $A + B \cdot C = (A + B) \cdot (A + C)$

19. 2개의 변수 A 와 B 로 표시된 것 중 옳지 않은 것은?

- ① 논리합의 부정 : $\overline{A+B}$
- ② 논리곱의 부정 : $\overline{A \cdot B}$
- ③ 배타적 논리합 : $\overline{A}B + A\overline{B}$
- ④ 논리합 : $A+B$

③ 배타적 논리합 : $\overline{A}B + A\overline{B} = A \oplus B$

20. 다음 중 논리식 $\overline{A+B}$ 와 등가인 회로는?



$\overline{A+B} = \overline{A}B$ ← NAND 게이트

21. 드모르간(De Morgan)의 정리를 옳게 나타낸 것은?

① $\overline{A+B} = A+B$

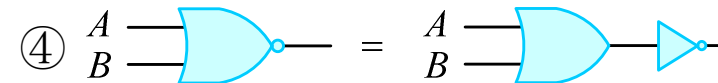
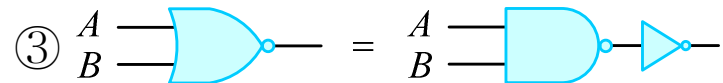
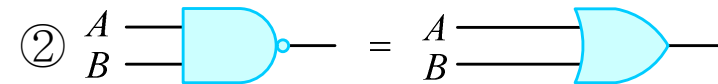
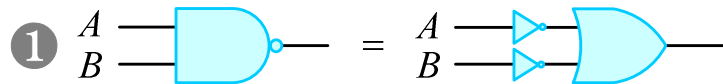
② $\overline{A+B} = A \cdot B$

③ $\overline{A+B} = \overline{A} \cdot \overline{B}$

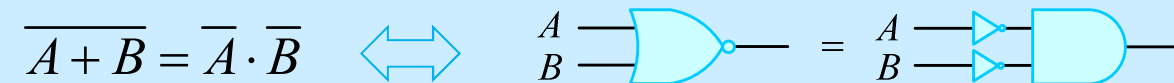
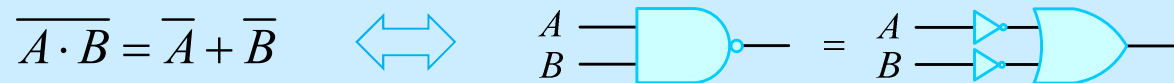
④ $\overline{A+B} = \overline{A} + \overline{B}$

드모르간의 정리 : $\overline{A \cdot B} = \overline{A} + \overline{B}$ $\overline{A+B} = \overline{A} \cdot \overline{B}$

22. 다음의 논리회로도에서 드모르간(De Morgan)의 정리를 나타내는 것은 어느 것인가?



드모르간(De Morgan)의 정리



23. 다음 논리식은 무슨 법칙을 활용하여 전개한 것인가?

$$F = \overline{C}(\overline{AB}) = \overline{C}(\overline{A} + \overline{B}) = \overline{C + AB} = \overline{AB + C}$$

- ① 보수와 병렬의 법칙
- ② 드모르간(De Morgan)의 법칙
- ③ 교차와 병렬의 법칙
- ④ 적(積)과 화(和)의 분배의 법칙

24. 다음 식을 쌍대(duality)식으로 표시한 것은?

$$\overline{A + B} = \overline{A} \cdot \overline{B}$$

- | | |
|--|--|
| ① $A + B = A \cdot B$ | ② $A \cdot B = \overline{A + B}$ |
| ③ $\overline{A} \cdot \overline{B} = \overline{A + B}$ | ④ $\overline{A \cdot B} = \overline{A} + \overline{B}$ |

쌍대성(duality)

불 대수 공리나 기본 법칙에서 좌우 한 쌍에서 0과 1을 서로 바꾸고
동시에 ‘ $\cdot$ ’과 ‘ $+$ ’를 서로 바꾸면 다른 한 쪽이 얻어지는 성질

25. $A + \bar{A} = 1$ 의 쌍대인 것을 표시한 식은?

- ① $A \cdot \bar{A} = 0$ ② $A \cdot \bar{A} = 1$
 ③ $A + \bar{A} = A$ ④ $A + \bar{A} = 0$

쌍대성 : 0과 1을 서로 바꾸고, 동시에 ‘ $\cdot$ ’과 ‘ $+$ ’를 서로 바꿈
 $A \cdot \bar{A} = 0$

26. 다음 논리식의 조건이 옳은 것은?

$$A\bar{B} + \bar{C} = 1$$

- ① $A=0, B=1, C=1$ ② $A=1, B=1, C=1$
 ③ $A=0, B=1, C=0$ ④ $A=0, B=0, C=1$

- ① $A=0, B=1, C=1 : A\bar{B} + \bar{C} = 0 \cdot \bar{1} + \bar{1} = 0$
 ② $A=1, B=1, C=1 : A\bar{B} + \bar{C} = 1 \cdot \bar{1} + \bar{1} = 0$
 ③ $A=0, B=1, C=0 : A\bar{B} + \bar{C} = 0 \cdot \bar{1} + \bar{0} = 1$
 ④ $A=0, B=0, C=1 : A\bar{B} + \bar{C} = 0 \cdot \bar{0} + \bar{1} = 0$

27. 논리식 $A+AB$ 를 간단히 한 결과는?

① $A+B$

② A

③ B

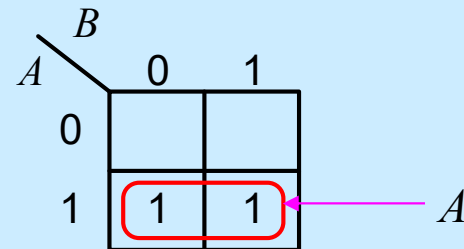
④ 1

• 불 대수 이용

$$A + AB = A(1 + B) = A$$

• 카르노 맵 이용

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



28. 불 대수식 $A(\bar{A}+B)$ 를 간단히 하면?

- | | |
|--------|---------|
| ① A | ② B |
| ③ AB | ④ $A+B$ |

$$A(\bar{A} + B) = A\bar{A} + AB = 0 + AB = AB$$

29. 논리식 $\bar{A}+B+\bar{A}+\bar{B}$ 를 최소화하여 정리하면?

- | | |
|-------------|-------------|
| ① $\bar{A}$ | ② $\bar{B}$ |
| ③ 1 | ④ B |

$$\bar{A} + B + \bar{A} + \bar{B} = (\bar{A} + \bar{A}) + (B + \bar{B}) = \bar{A} + 1 = 1$$

30. $X = (A+B)(\overline{A \cdot B})$ 와 같은 것은?

① $A + \overline{B}$

② $\overline{A}B + A\overline{B}$

③ $A + B$

④ $\overline{A} + B$

$$\begin{aligned} X &= (A + B)(\overline{A \cdot B}) = (A + B)(\overline{A} + \overline{B}) \\ &= A\overline{A} + A\overline{B} + \overline{A}B + B\overline{B} = A\overline{B} + \overline{A}B \end{aligned}$$

31. 다음 논리식을 최소화시킬 때 올바른 것은?

$$F = (A + B)(A + \overline{B})$$

① A

② $A+B$

③ $A+\overline{B}$

④ $A\overline{B}$

$$F = (A + B)(A + \overline{B}) = AA + A\overline{B} + AB + B\overline{B} = A + A\overline{B} + AB = A(1 + \overline{B} + B) = A$$

32. 논리식 $Y = \overline{A + AB}$ 를 간략화하면?

① $Y = A\overline{B}$

② $Y = \overline{A}$

③ $Y = 1$

④ $Y = AB$

$$Y = \overline{A + AB} = \overline{A} \cdot \overline{AB} = \overline{A} \cdot (\overline{A} + \overline{B}) = \overline{A} \cdot (\overline{A} + B) = \overline{A} \cdot \overline{A} + \overline{A} \cdot B = \overline{A}(1 + B) = \overline{A}$$

33. 다음 논리식 $\overline{AB} + A\overline{B} + AB$ 를 간단히 표현하면?

① $A + B$

② $\overline{A} + B$

③ $A + \overline{B}$

④ $\overline{A} + \overline{B}$

$$\overline{AB} + A\overline{B} + AB = \overline{\overline{A} + \overline{B}} + A\overline{B} + AB = A + \overline{B} + A\overline{B} + AB = A(1 + \overline{B} + B) + \overline{B} = A + \overline{B}$$

34. 다음 중 결과가 다른 하나는?

① $A(A+B)$

② $A+AB$

③ $1 \cdot A$

④ $A+1$

① $A(A+B) = AA+AB = A(1+B) = A$

② $A+AB = A(1+B) = A$

③ $1 \cdot A = A$

④ $A+1 = A$

35. 논리식 $Y = A+AB+AC$ 를 간소화하면?

① $Y = A$

② $Y = B$

③ $Y = A+B$

④ $Y = A+C$

$Y = A + AB + AC = A(1 + B + C) = A$

36. 논리식 $A(A+B+C)$ 를 간단히 하면 어느 것과 같은가?

① 1

② 0

③ $B+C$

④ A

$$A(A+B+C) = AA + AB + AC = A + AB + AC = A(1+B+C) = A \cdot 1 = A$$

37. 논리식 $\overline{AB+AB}$ 와 같은 것은?

① $AB + \overline{AB}$

② $\overline{AB} + \overline{AB}$

③ $AB + \overline{AB}$

④ $\overline{AB} + \overline{A} + \overline{B}$

$$\begin{aligned} \overline{AB + AB} &= \overline{AB} \cdot \overline{AB} = (A + \overline{B})(\overline{A} + B) \\ &= A\overline{A} + AB + \overline{AB} + B\overline{B} = AB + \overline{AB} = A \odot B \end{aligned}$$

38. 다음 논리식을 간단히 하면?

$$\overline{\overline{A+B}} + \overline{\overline{A+B}}$$

① $A+B$

② AB

③ A

④ B

$$\overline{\overline{A+B}} + \overline{\overline{A+B}} = \overline{A+B} + \overline{A+B} = \overline{A+B} = A$$

39. 불 대수식 $\overline{\overline{AB}} \cdot \overline{\overline{AB}}$ 을 간단히 한 결과는?

① $\overline{AB} + AB$

② 1

③ $\overline{AB} + \overline{AB}$

④ $\overline{AB} + \overline{AB}$

$$\overline{\overline{\overline{AB}}} \cdot \overline{\overline{\overline{AB}}} = \overline{\overline{AB}} + \overline{\overline{AB}} = \overline{AB} + \overline{AB}$$

40. 다음 식을 간소화하면 어떻게 표시되는가?

$$\overline{\overline{A+B}} + \overline{\overline{A+B}} + \overline{\overline{AB}} \cdot \overline{\overline{AB}}$$

① 1

② 0

③ $A+B$

④ AB

$$\begin{aligned} \overline{\overline{A+B}} + \overline{\overline{A+B}} + \overline{\overline{AB}} \cdot \overline{\overline{AB}} &= \overline{\overline{A+B}} \cdot \overline{\overline{A+B}} + \overline{\overline{AB}} + \overline{\overline{AB}} \\ &= (\overline{A+B})(A+B) + \overline{AB} + \overline{AB} \\ &= A\overline{A} + \overline{A}B + AB + B\overline{B} + \overline{AB} + \overline{AB} \\ &= \overline{A}B + AB + \overline{AB} + \overline{AB} = 1 \end{aligned}$$

41. 다음 논리식을 간소화하면 어떻게 되는가?

$$Y = \overline{A}\overline{B} + A\overline{B} + \overline{A}B + AB$$

① $Y = \overline{A} + \overline{B}$

② $Y = A + \overline{B}$

③ $Y = 1$

④ $Y = AB$

$$Y = \overline{A}\overline{B} + A\overline{B} + \overline{A}B + AB = \overline{A}(\overline{B} + B) + A(\overline{B} + B) = \overline{A} + A = 1$$

42. 논리식 중 다른 값을 나타내는 논리식은?

① $XY + X\overline{Y}$

② $(X + Y)(X + \overline{Y})$

③ $X(X + Y)$

④ $X(\overline{X} + Y)$

① $XY + X\overline{Y} = X(Y + \overline{Y}) = X \cdot 1 = X$

② $(X + Y)(X + \overline{Y}) = XX + X\overline{Y} + XY + Y\overline{Y} = X + X\overline{Y} + XY = X(1 + \overline{Y} + Y) = X \cdot 1 = X$

③ $X(X + Y) = XX + XY = X + XY = X(1 + Y) = X \cdot 1 = X$

④ $X(\overline{X} + Y) = X\overline{X} + XY = XY$

43. 다음 불 대수식과 등가인 것은?

$$A + B \cdot C$$

① $A \cdot B \cdot (A + C)$

② $(A + B) \cdot (A + C)$

③ $(A + B) \cdot A \cdot C$

④ $(A + B) \cdot \overline{(A + C)}$

$$A + B \cdot C = (A + B)(A + C) \quad (\leftarrow \text{분배 법칙})$$

44. 다음 논리식과 **다른** 것은?

$$Z = \overline{(A + \overline{B \cdot C})}$$

$$\textcircled{1} Z = \overline{A} \cdot B + \overline{A \cdot C}$$

$$\textcircled{2} Z = \overline{A} \cdot (\overline{\overline{B \cdot C}})$$

$$\textcircled{3} Z = \overline{A} \cdot B + \overline{A} \cdot \overline{C}$$

$$\textcircled{4} Z = \overline{A} \cdot (B + \overline{C})$$

$$\textcircled{1} Z = \overline{A} \cdot B + \overline{A \cdot C} = \overline{A}B + \overline{A} + \overline{C} = \overline{A}(B + 1) + \overline{C} = \overline{A} + \overline{C}$$

$$\textcircled{2} Z = \overline{A} \cdot (\overline{\overline{B \cdot C}}) = \overline{A}(\overline{\overline{B}} + \overline{\overline{C}}) = \overline{A}(B + \overline{C}) = \overline{A}B + \overline{A}\overline{C}$$

$$\textcircled{3} Z = \overline{A}B + \overline{A}\overline{C}$$

$$\textcircled{4} Z = \overline{A} \cdot (B + \overline{C}) = \overline{A}B + \overline{A}\overline{C}$$

45. 불 대수식 $(A+B)(A+C)$ 와 등가인 것은?

① BC ② ABC ③ $A+B+C$ ④ $A+BC$

$$\begin{aligned}(A+B)(A+C) &= AA + AC + AB + BC = A + AC + AB + BC \\ &= A(1 + C + B) + BC = A + BC\end{aligned}$$

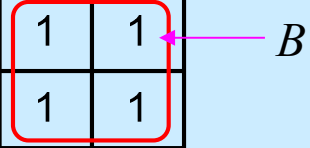
46. 다음 논리식 F 를 간소화한 것은?

$$F = \overline{A}(BC + B\overline{C}) + A(BC + B\overline{C})$$

- ① B ② BC
 ③ AC ④ $A+B\overline{C}$

$$\begin{aligned}
 F &= \overline{A}(BC + B\overline{C}) + A(BC + B\overline{C}) \\
 &= (\overline{A} + A)(BC + B\overline{C}) \\
 &= BC + B\overline{C} = B(C + \overline{C}) = B
 \end{aligned}$$

		BC			
A		00	01	11	10
	0			1	1
	1			1	1



47. 논리식 $\overline{B}(\overline{A}+C)(B+\overline{C})$ 를 간소화하면?

① ABC

② $\overline{A} \cdot \overline{B} \cdot \overline{C}$

③ $A+B+C$

④ $\overline{A}+\overline{B}+\overline{C}$

$$\begin{aligned}\overline{B}(\overline{A}+C)(B+\overline{C}) &= \overline{B}(\overline{A}B + \overline{A}\overline{C} + BC + C\overline{C}) \\ &= \overline{A}B\overline{B} + \overline{A}\overline{B}\overline{C} + B\overline{B}C + \overline{B}C\overline{C} = \overline{A}\overline{B}\overline{C}\end{aligned}$$

48. 논리식 $f = xy + wxy$ 식을 간단히 하면?

- ① xy ② w ③ wxy ④ wx

$$f = xy + wxy = xy(1 + w) = xy$$

49. 논리식 $A\bar{B}\bar{C} + AB\bar{C}$ 를 간소화하면?

- ① $A\bar{C}$ ② $\bar{A}C$ ③ AC ④ AB

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

	BC			
	00	01	11	10
A 0				
1	1			1

50. 다음 불 대수식을 간소화할 때 맞는 것은?

$$RST + RS(\bar{T} + V)$$

- ① $R\bar{S}\bar{T}$ ② RSV ③ RST ④ RS

$$RST + RS(\bar{T} + V) = RS(T + \bar{T} + V) = RS(1 + V) = RS$$

51. 불 대수식 $A + \bar{B}C + C\bar{D} + \bar{A}$ 를 간단히 하면?

- ① 1 ② A ③ B ④ C

$$A + \bar{B}C + C\bar{D} + \bar{A} = A + \bar{A} + \bar{B}C + C\bar{D} = 1 + \bar{B}C + C\bar{D} = 1$$

52. 다음 논리 함수식 $A(A+B+C+D)$ 를 간략화하면?

① 1

② 0

③ A

④ B

$$\begin{aligned} A(A+B+C+D) &= AA + AB + AC + AD = A + AB + AC + AD \\ &= A(1+B+C+D) = A \cdot 1 = A \end{aligned}$$

53. 논리식 $\overline{A}\overline{B} + \overline{A}\overline{B}C + \overline{A}\overline{B}(D+E)$ 를 간단히 하면?

① $\overline{A}\overline{B}(D+E)$

② $\overline{A}B(D+E)$

③ $\overline{A}B$

④ $\overline{A}\overline{B}$

$$\overline{A}\overline{B} + \overline{A}\overline{B}C + \overline{A}\overline{B}(D+E) = \overline{A}\overline{B}(1 + C + (D+E)) = \overline{A}\overline{B}$$

54. 다음 논리식을 간단히 하면?

$$Y = \overline{(A+B)\overline{C}\overline{D} + E + F}$$

① $Y = (\overline{A}\overline{B} + C + D)\overline{E}\overline{F}$

② $Y = (\overline{A}\overline{B} + C + D)E\overline{F}$

③ $Y = (\overline{A}\overline{B} + C + D)\overline{E}\overline{F}$

④ $Y = (\overline{A}\overline{B} + \overline{C} + \overline{D})E\overline{F}$

$$\begin{aligned} Y &= \overline{(A+B)\overline{C}\overline{D} + E + F} = \overline{(A+B)\overline{C}\overline{D}} \cdot \overline{E} \cdot \overline{F} \\ &= (\overline{A+B} + \overline{\overline{C}} + \overline{\overline{D}})\overline{E}\overline{F} = (\overline{A}\overline{B} + C + D)\overline{E}\overline{F} \end{aligned}$$

55. 다음과 같이 주어지는 논리식을 불 대수를 적용하여 간소화한 것은?

$$Z = (A + \overline{BC} + D + EF)(A + \overline{BC} + \overline{D + EF})$$

① $Z = D + EF$

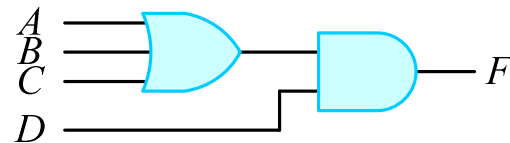
② $Z = \overline{BC} + D + EF$

③ $Z = A + \overline{BC}$

④ $Z = A + D$

$$\begin{aligned} Z &= (A + \overline{BC} + D + EF)(A + \overline{BC} + \overline{D + EF}) \\ &= (A + \overline{BC})(A + \overline{BC}) + (A + \overline{BC})(D + EF) + (D + EF)(A + \overline{BC}) + (D + EF)(\overline{D + EF}) \\ &= (A + \overline{BC})(1 + D + EF + D + EF) = A + \overline{BC} \end{aligned}$$

56. 그림과 같은 논리회로의 출력 F 를 나타낸 논리식은?



① $(ABC)D$

② $(ABC)+D$

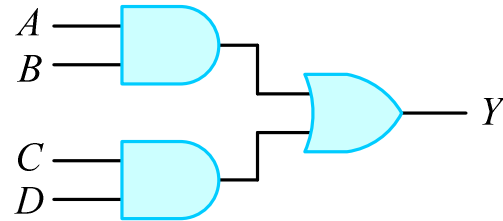
③ $(A+B+C)D$

④ $A+B+C+D$

$$F = (A + B + C)D$$

57. 그림과 같은 논리 게이트의 출력은?

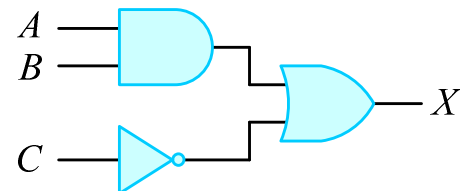
- ① $A + B + C + D$
- ② $(A + B) + CD$
- ③ $AB + (C + D)$
- ④ $AB + CD$



$$Y = AB + CD$$

58. 그림과 같은 논리회로의 출력 X 는?

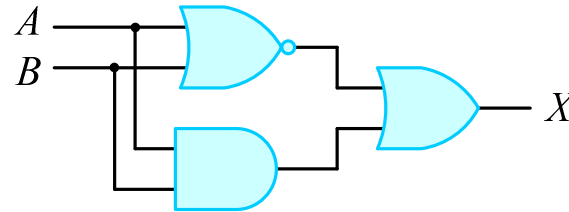
- ① $(A + B)\overline{C}$
- ② ABC
- ③ $\overline{AB} + C$
- ④ $AB + \overline{C}$



$$X = AB + \overline{C}$$

59. 그림과 같은 논리회로의 출력 X 는?

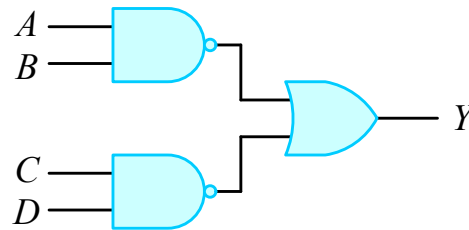
- ① $X = \overline{(A+B)} \cdot \overline{(A \cdot B)}$
- ② $X = (A+B) \cdot \overline{(A \cdot B)}$
- ③ $X = \overline{(A+B)} + (A \cdot B)$
- ④ $X = (A+B) + (A \cdot B)$



$$X = \overline{(A+B)} + (A \cdot B)$$

60. 그림의 회로를 논리식으로 표시한 것 중 옳은 것은?

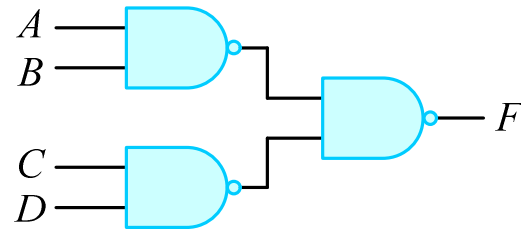
- ① $Y = \overline{AB} + \overline{CD}$
- ② $Y = (A+B)(C+D)$
- ③ $Y = AB + CD$
- ④ $Y = \overline{A+B} + \overline{C+D}$



$$Y = \overline{AB} + \overline{CD}$$

61. 다음 논리회로의 출력 F 는?

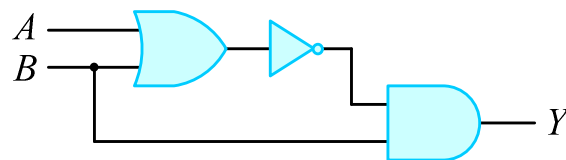
- ① $\overline{AB + CD}$
- ② $\overline{(A + B)(C + D)}$
- ③ $(A + B)(C + D)$
- ④ $AB + CD$



$$F = \overline{\overline{AB}} \cdot \overline{\overline{CD}} = \overline{\overline{AB}} + \overline{\overline{CD}} = AB + CD$$

62. 그림과 같은 회로에서 출력 Y 는?

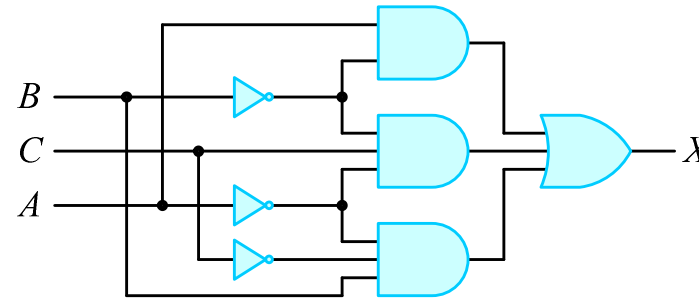
- ① $Y = A \cdot B + B$
- ② $Y = \overline{A \cdot B} + B$
- ③ $Y = \overline{A + B} + B$
- ④ $Y = \overline{(A + B)} \cdot B$



$$Y = \overline{(A + B)} \cdot B$$

63. 다음과 같은 논리회로를 논리식으로 표시하면?

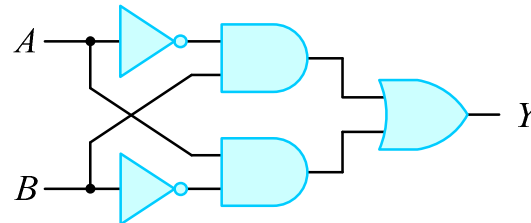
- ① $X = \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C}$
- ② $X = ABC + A\overline{B}C + \overline{A}B\overline{C}$
- ③ $X = \overline{A}B\overline{C} + \overline{A}\overline{B}C + A\overline{B}\overline{C}$
- ④ $X = \overline{A}BC + A\overline{B}C + A\overline{B}\overline{C}$



$$X = \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C}$$

64. 다음 회로의 출력 Y의 논리식은?

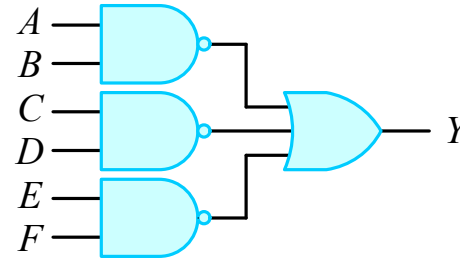
- ① $Y = AB + \overline{A}\overline{B}$
- ② $Y = \overline{A}\overline{B} + A\overline{B}$
- ③ $Y = \overline{A}\overline{B} + AB$
- ④ $Y = A\overline{B} + \overline{A}B$



$$Y = A\overline{B} + \overline{A}B$$

65. 다음 논리회로의 출력식으로 옳은 것은?

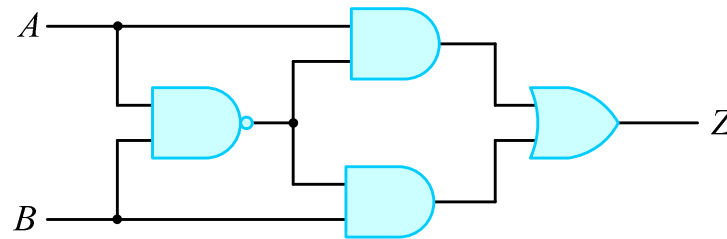
- ① $Y = \overline{AB} \cdot \overline{CD} \cdot \overline{EF}$
- ② $Y = \overline{AB + CD + EF}$
- ③ $Y = AB + CD + EF$
- ④ $Y = \overline{AB \cdot CD \cdot EF}$



$$Y = \overline{AB} + \overline{CD} + \overline{EF} = \overline{AB \cdot CD \cdot EF}$$

66. 그림과 같이 결선된 논리회로의 논리식은?

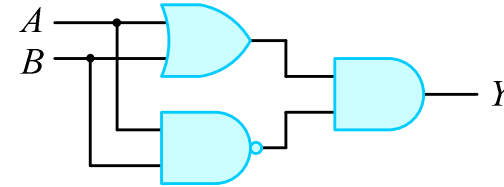
- ① $Z = (A + B)AB$
- ② $Z = (\overline{AB})(A + B)$
- ③ $Z = (\overline{AB})(\overline{A} + \overline{B})$
- ④ $Z = (A + B)(\overline{A} + \overline{B})$



$$Z = A \cdot \overline{AB} + B \cdot \overline{AB} = \overline{AB}(A + B)$$

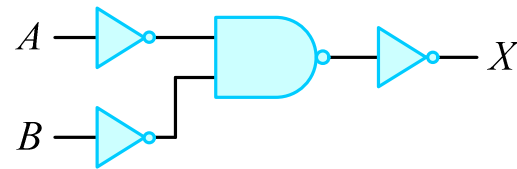
67. 다음과 같은 논리회로의 출력 Y 는?

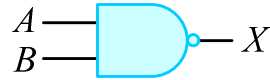
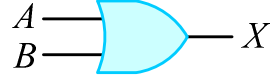
- ① $AB + \overline{A}B$ ② $(A + \overline{B})\overline{A}\overline{B}$
 ③ $AB(\overline{A} + \overline{B})$ ④ $(A + B)(\overline{A} + \overline{B})$



$$(A + B)(\overline{A}\overline{B}) = (A + B)(\overline{A} + \overline{B})$$

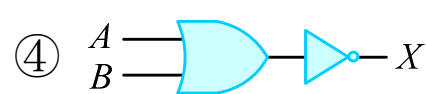
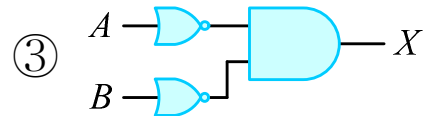
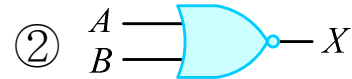
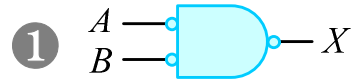
68. 다음 논리회로를 간단히 하면?



- ①  ② 
 ③  ④ 

$$X = \overline{A}\overline{B} = \overline{A + B}$$

69. 다음 논리회로 중 기능이 다른 것은?



$$\textcircled{1} \quad X = \overline{\overline{A}\overline{B}} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$$

$$\textcircled{2} \quad X = \overline{A + B}$$

$$\textcircled{3} \quad X = \overline{\overline{A}\overline{B}} = \overline{\overline{A + B}}$$

$$\textcircled{4} \quad X = \overline{A + B}$$

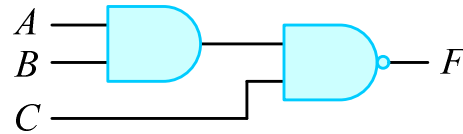
70. 다음과 같은 논리회로의 출력은?

① $A + BC$

② $\overline{AB} + \overline{C}$

③ ABC

④ $A + B + C$



$$\overline{ABC} = \overline{AB} + \overline{C} = \overline{A} + \overline{B} + \overline{C}$$

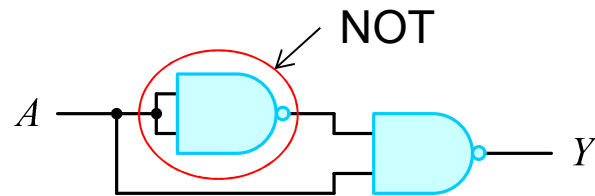
71. 다음 논리회로의 출력식은?

① $Y = A$

② $Y = \overline{A}$

③ $Y = 1$

④ $Y = 0$



$$Y = \overline{\overline{A}A} = \overline{\overline{A}} + \overline{A} = A + \overline{A} = 1$$

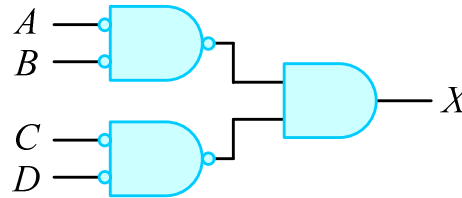
72. 다음 논리회로의 논리식은?

① $A + B + C + D$

② $\overline{AB \cdot CD}$

③ $AB + CD$

④ $(A + B)(C + D)$



$$X = \overline{\overline{A}\overline{B}} \cdot \overline{\overline{C}\overline{D}} = (\overline{\overline{A}} + \overline{\overline{B}}) \cdot (\overline{\overline{C}} + \overline{\overline{D}}) = (A + B)(C + D)$$

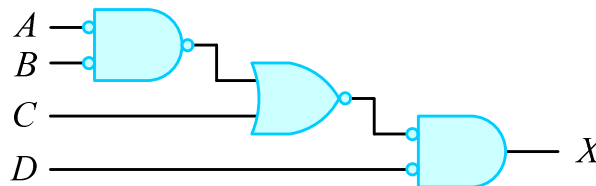
73. 다음 논리회로의 출력(X)이 옳은 것은?

① $(AB + C)\overline{D}$

② $A + B + C + \overline{D}$

③ $(A + B + C)\overline{D}$

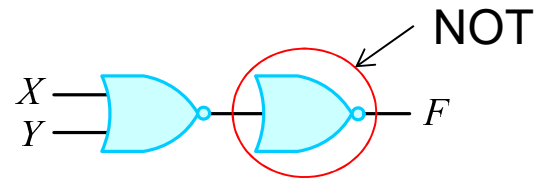
④ $(AB + CD)$



$$X = (\overline{\overline{A}\overline{B}} + C)\overline{D} = (\overline{\overline{A}} + \overline{\overline{B}} + C)\overline{D} = (A + B + C)\overline{D}$$

74. 다음 그림은 무슨 게이트를 나타낸 것인가?

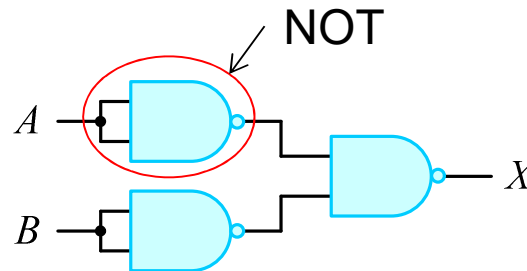
- ① AND 게이트
- ② OR 게이트
- ③ NOR 게이트
- ④ NAND 게이트



$$F = \overline{X + Y} = X + Y$$

75. 다음 그림과 같이 NAND 게이트가 연결되어 있다. 이 회로와 등가인 게이트는?

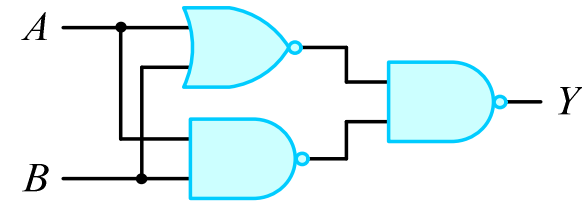
- ① OR 게이트
- ② AND 게이트
- ③ NOR 게이트
- ④ NAND 게이트



$$X = \overline{\overline{A} \cdot \overline{B}} = A + B$$

76. 다음 논리회로의 출력 Y 와 같은 게이트는?

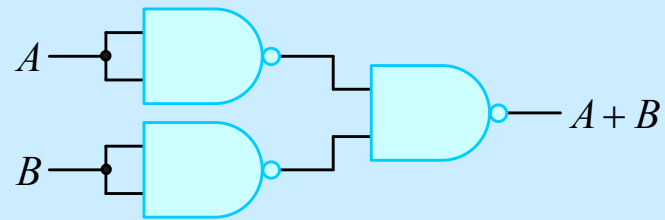
- ① XNOR 게이트 ② OR 게이트
③ XOR 게이트 ④ NOR 게이트



$$\begin{aligned}
 Y &= \overline{(A+B) \cdot (AB)} = \overline{(A+B)} + \overline{(AB)} \\
 &= (A+B) + AB = A + B + AB = A(1+B) + B = A + B
 \end{aligned}$$

77. 2입력을 갖는 OR 게이트를 NAND 게이트로 구현하려면 최소한 몇 개의 NAND 게이트가 필요한가?

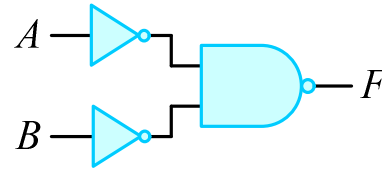
- ① 1개 ② 2개
③ 3개 ④ 4개



2입력 OR 게이트를 NAND 게이트만으로 구현

78. 다음 논리회로의 출력 F 는?

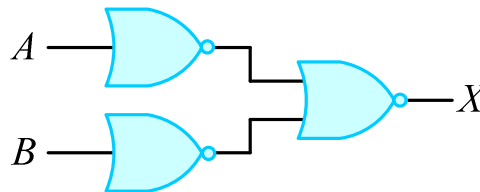
- ① $A \cdot B$
- ② $A + B$
- ③ $\overline{A \cdot B}$
- ④ $\overline{A + B}$



$$F = \overline{\overline{A} \cdot \overline{B}} = A + B$$

79. 다음 그림은 어떤 논리 연산을 표시하는가?

- ① NOR
- ② OR
- ③ NAND
- ④ AND



$$X = \overline{\overline{A} + \overline{B}} = A \cdot B$$

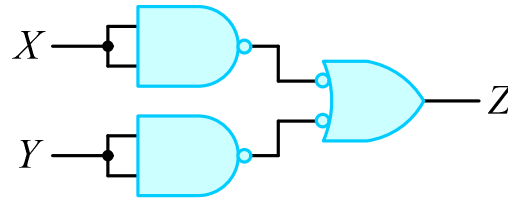
80. 그림의 논리 다이어그램이 나타내는 논리식은?

① $Z = X + Y$

② $Z = X \cdot Y$

③ $Z = \overline{X} + \overline{Y}$

④ $Z = \overline{X + Y}$



$$Z = \overline{\overline{X}} + \overline{\overline{Y}} = X + Y$$

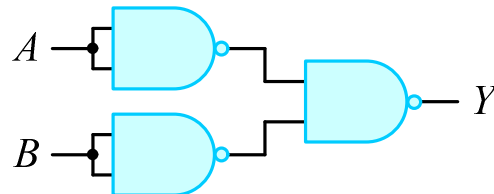
81. 다음 논리회로의 출력 Y가 0이 될 입력의 조합은?

① $A=0, B=0$

② $A=0, B=1$

③ $A=1, B=0$

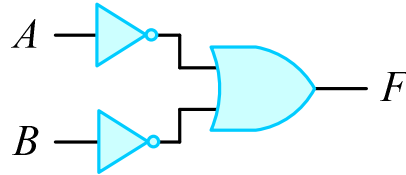
④ $A=1, B=1$



$$Y = \overline{\overline{A}} \cdot \overline{\overline{B}} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$$

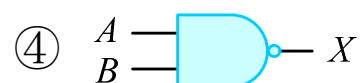
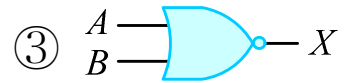
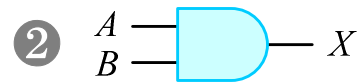
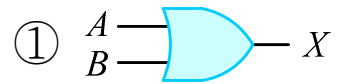
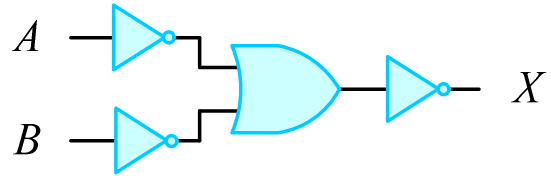
82. 그림의 논리회로는 어떤 게이트 함수와 같은가?

- ① NOR
- ② NAND
- ③ XOR
- ④ AND



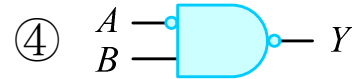
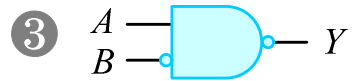
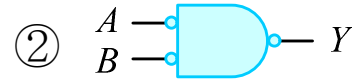
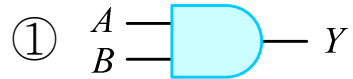
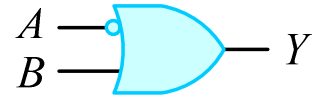
$$F = \overline{A} + \overline{B} = \overline{A \cdot B}$$

83. 다음 논리회로를 간소화하면?



$$X = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}} = A \cdot B$$

84. 다음 그림과 등가인 게이트는?



$$Y = \overline{A} + B$$

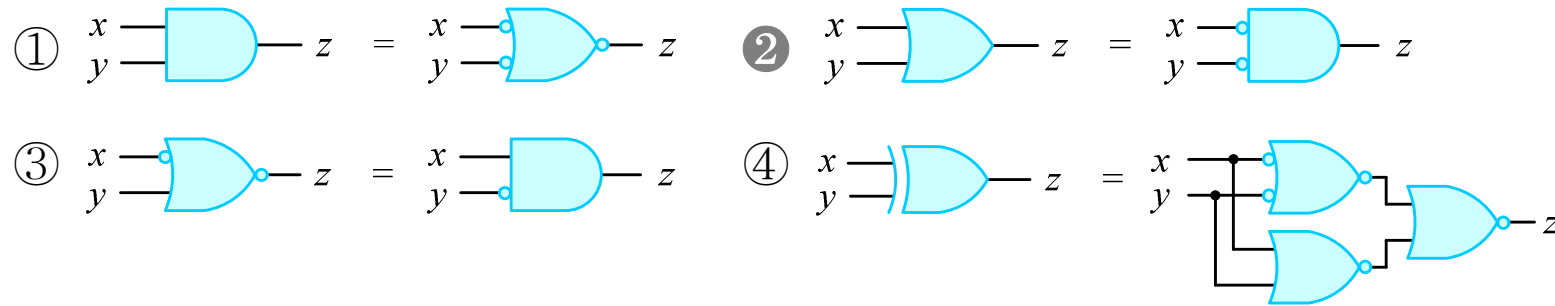
① $Y = A + B$

② $Y = \overline{\overline{A} \overline{B}} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$

③ $Y = \overline{\overline{A} \overline{B}} = \overline{\overline{A}} + B$

④ $Y = \overline{\overline{A} B} = A + \overline{B}$

85. 그림에서 회로의 등가가 성립되지 않는 것은?



$$\textcircled{1} \quad z = \overline{\overline{x + y}} = \overline{\overline{x} \cdot \overline{y}} = x \cdot y$$

$$\textcircled{2} \quad z = \overline{\overline{x} \cdot \overline{y}} = \overline{\overline{x + y}}$$

$$\textcircled{3} \quad z = \overline{\overline{x + y}} = \overline{\overline{x} \cdot \overline{y}} = x \cdot y$$

$$\textcircled{4} \quad z = \overline{\overline{(x + y)} + \overline{(x + y)}} = \overline{\overline{(x + y)} \cdot \overline{(x + y)}} = \overline{(\overline{x} + \overline{y})(x + y)} = \overline{\overline{x}y + x\overline{y}} = x \oplus y$$

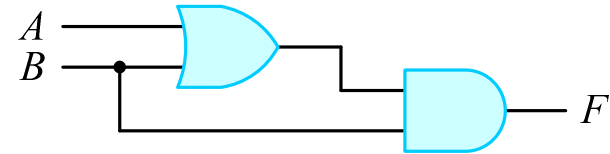
86. 다음 논리회로의 출력 F 는?

① A

② B

③ $A+B$

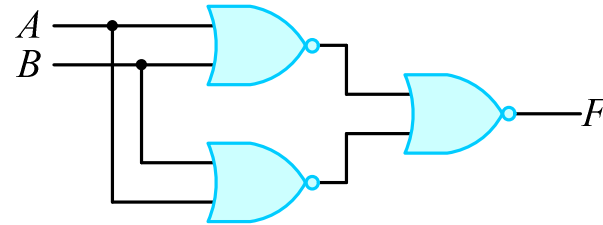
④ $A \cdot B$



$$F = (A + B)B = AB + BB = AB + B = (A + 1)B = B$$

87. 논리회로를 바르게 표시한 논리식은?

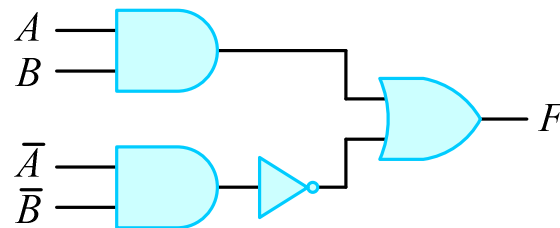
- ① $F = A \cdot B$
- ② $F = \overline{A} + \overline{B}$
- ③ $F = \overline{A} \cdot \overline{B}$
- ④ $F = A + B$



$$F = \overline{\overline{A+B} + \overline{A+B}} = \overline{\overline{A+B}} = A+B$$

88. 그림과 같은 회로의 논리식은?

- ① AB
- ② $A + B$
- ③ $\overline{A} + \overline{B}$
- ④ $\overline{A} \cdot \overline{B}$



$$F = AB + \overline{\overline{A} \cdot \overline{B}} = AB + A + B = A(1+B) + B = A+B$$

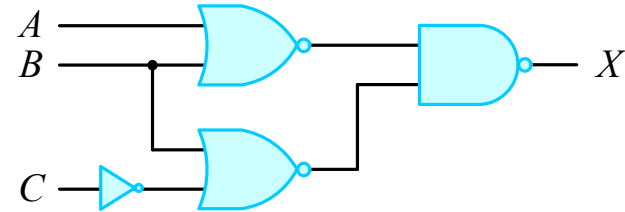
89. 다음 회로에서 출력 X 에 대한 불 대수식은?

① $X = A + B + C$

② $X = B + AC$

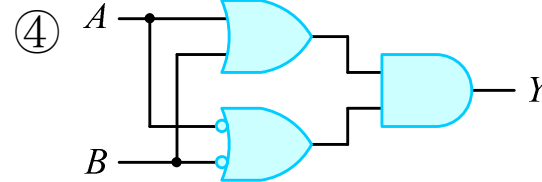
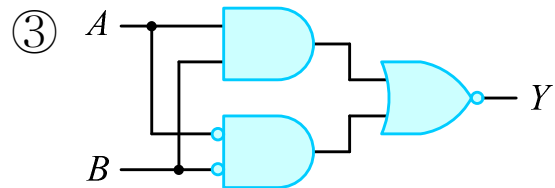
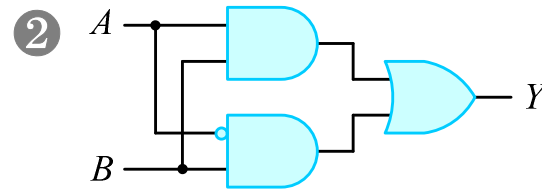
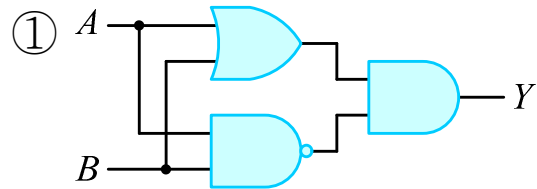
③ $X = A + BC$

④ $X = A + B + \bar{C}$



$$X = \overline{\overline{A+B}} \overline{\overline{B+C}} = \overline{\overline{A+B}} + \overline{\overline{B+C}} = A + B + B + \bar{C} = A + B + \bar{C}$$

90. 다음 논리회로 중 출력 Y 가 논리적으로 같지 않은 것은?



$$\textcircled{1} \quad Y = (A + B)\overline{A}\overline{B} = (A + B)(\overline{A} + \overline{B}) = A\overline{A} + A\overline{B} + \overline{A}B + B\overline{B} = A\overline{B} + \overline{A}B$$

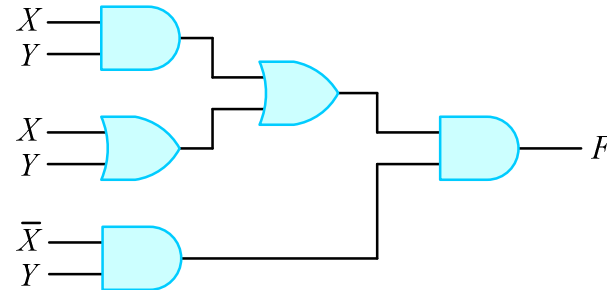
$$\textcircled{2} \quad Y = AB + \overline{A}B = (A + \overline{A})B = B$$

$$\textcircled{3} \quad Y = \overline{A}\overline{B} + \overline{A}B = (\overline{A} + \overline{B})(A + B) = A\overline{A} + A\overline{B} + \overline{A}B + B\overline{B} = A\overline{B} + \overline{A}B$$

$$\textcircled{4} \quad Y = (A + B)(\overline{A} + \overline{B}) = A\overline{A} + A\overline{B} + \overline{A}B + B\overline{B} = A\overline{B} + \overline{A}B$$

91. 다음 그림과 같은 회로의 논리식은 어느 것인가?

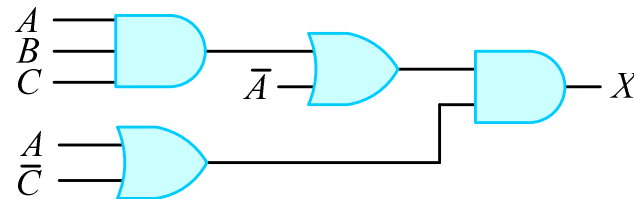
- ① XY
- ② $\overline{X} + Y$
- ③ $\overline{X}Y$
- ④ $X + Y$



$$F = (XY + (X + Y)) \cdot (\overline{X}Y) = XY\overline{X}Y + X\overline{X}Y + Y\overline{X}Y = \overline{X}Y$$

92. 그림과 같은 논리회로의 출력 X 는?

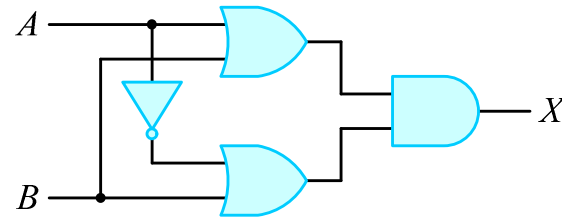
- ① $B + \overline{C}$
- ② ABC
- ③ $AB + BC$
- ④ $ABC + \overline{A}\overline{C}$



$$\begin{aligned} X &= (ABC + \overline{A})(A + \overline{C}) = ABCA + ABC\overline{C} + \overline{A}A + \overline{A}\overline{C} \\ &= ABC + \overline{A}\overline{C} \end{aligned}$$

93. 논리회로의 출력 X 는?

- ① AB
- ② A
- ③ B
- ④ $\overline{AB}$



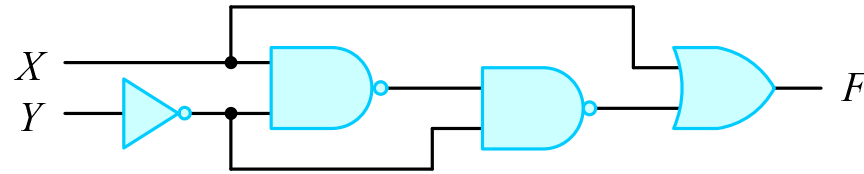
$$\begin{aligned}
 (A + B)(\overline{A} + B) &= A\overline{A} + AB + \overline{A}B + BB \\
 &= AB + \overline{A}B + B \\
 &= (A + \overline{A})B + B \\
 &= B + B = B
 \end{aligned}$$

		B	
		0	1
A	0		1
	1		1

A pink arrow points from the label 'B' to the rightmost column of the truth table, indicating that the output is B.

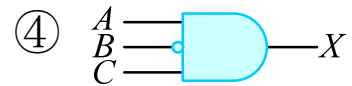
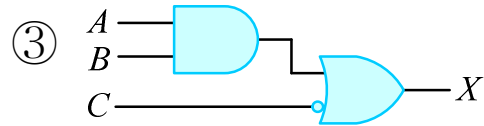
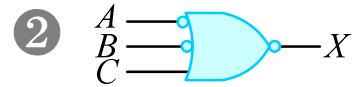
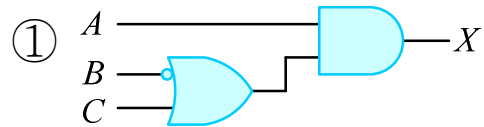
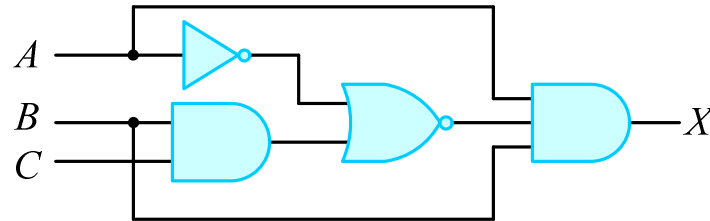
94. 다음 그림의 연산 결과로 옳은 것은?

- ① X
- ② Y
- ③ $X + Y$
- ④ $X\bar{Y} + X$



$$F = \overline{\overline{X}\overline{Y}} + X\overline{Y} + X = \overline{\overline{X}\overline{Y}} + \overline{Y} + X = X\overline{Y} + Y + X = X(1 + \overline{Y}) + Y = X + Y$$

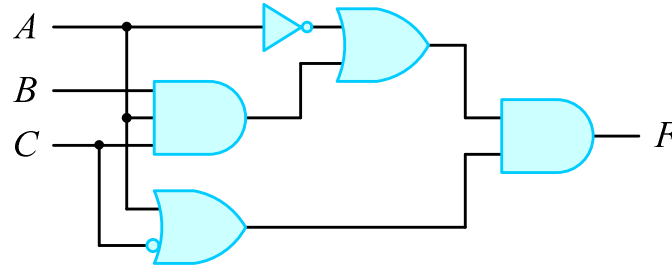
95. 그림과 같은 논리회로를 간소화한 회로는?



$$\begin{aligned}
 X &= \overline{BC} + \overline{A} \cdot A \cdot B = \overline{BC} \cdot A \cdot A \cdot B = (\overline{B} + \overline{C})AB = AB\overline{B} + AB\overline{C} = AB\overline{C} \\
 &= \overline{\overline{AB\overline{C}}} = \overline{\overline{A} + \overline{B} + C}
 \end{aligned}$$

96. 다음과 같은 논리회로의 출력(F)은?

- ① $ABC + \overline{AC}$
- ② $AB + \overline{ABC}$
- ③ $A + B + C$
- ④ ABC



$$F = (\overline{A} + ABC)(A + \overline{C}) = \overline{A}A + \overline{A}\overline{C} + AABC + ABC\overline{C} = \overline{A}\overline{C} + ABC$$

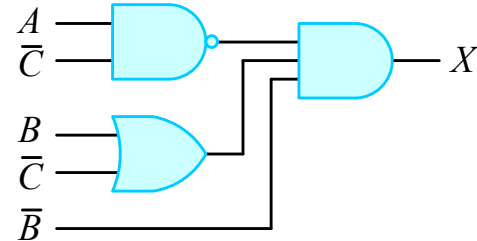
97. 그림과 같은 논리회로를 간소화하면?

① $X = A + B + C$

② $X = B + C$

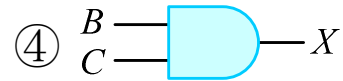
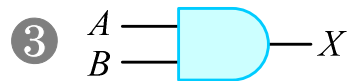
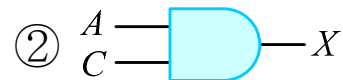
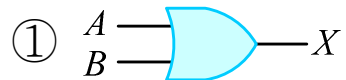
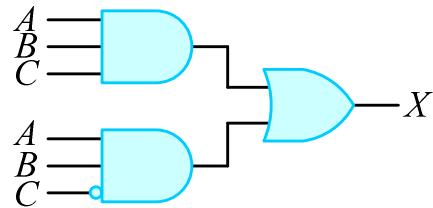
③ $X = \overline{A}\overline{B}\overline{C}$

④ $X = ABC$



$$X = \overline{A}\overline{C} \cdot (B + \overline{C}) \cdot \overline{B} = (\overline{A} + C)(B + \overline{C}) \cdot \overline{B} = \overline{A}B\overline{B} + \overline{A}B\overline{C} + C\overline{B}\overline{B} + C\overline{C}\overline{B} = \overline{A}B\overline{C}$$

98. 다음 논리회로를 간단히 하면?



$$X = ABC + AB\bar{C} = AB(C + \bar{C}) = AB$$

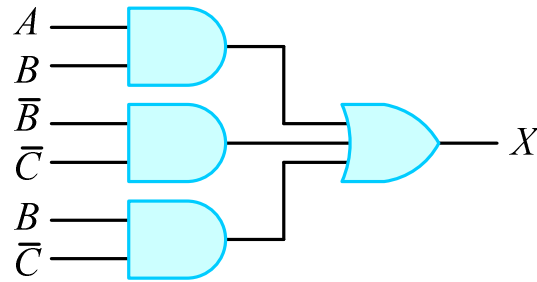
99. 그림의 논리회로를 간소화하였을 때 출력 X 는?

① $X = A\bar{B} + BC$

② $X = A + B$

③ $X = AB + \bar{C}$

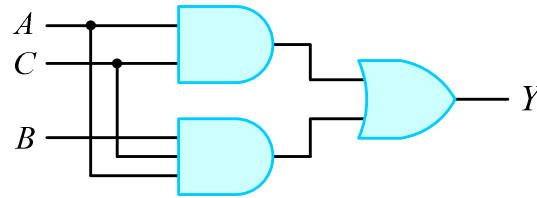
④ $X = AB$



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

100. 다음 논리회로(logic circuit)의 출력은?

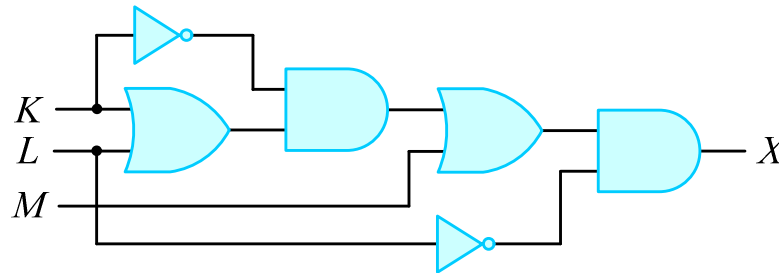
- ① AB
- ② AC
- ③ ABC
- ④ $AB + \overline{AC}$



$$Y = AC + ABC = AC(1 + B) = AC$$

101. 그림의 논리회로에서 출력 X 의 논리식은?

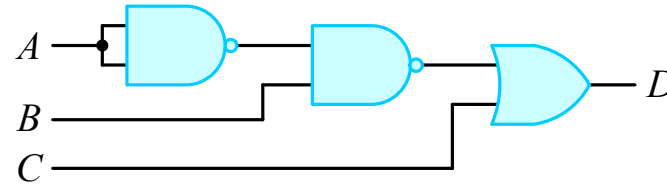
- ① $X = \overline{L}M$
- ② $X = LK + \overline{K}M$
- ③ $X = M + \overline{L} + K$
- ④ $X = \overline{K}(K + L) + \overline{L}$



$$X = ((K + L)\overline{K} + M)\overline{L} = (K\overline{K} + L\overline{K} + M)\overline{L} = \overline{L}L\overline{K} + M\overline{L} = \overline{L}M$$

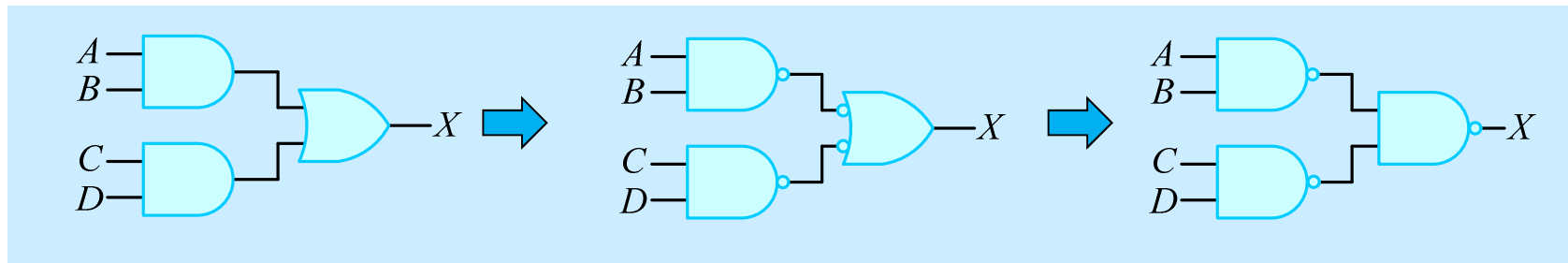
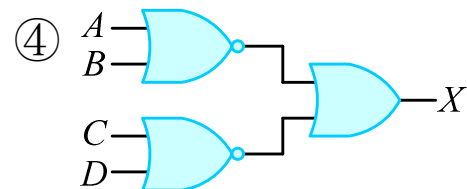
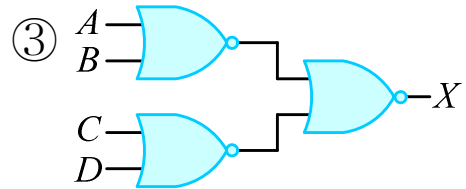
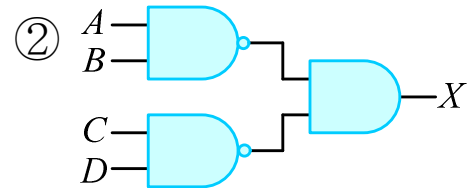
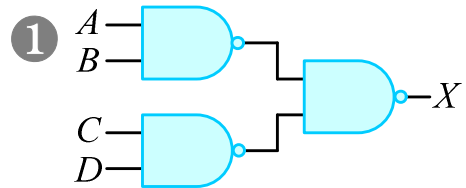
102. 다음 그림의 논리회로에 대한 논리식은?

- ① $D = (\bar{A} + B)C$
- ② $D = (A + \bar{B}) + C$
- ③ $D = (\bar{A} + \bar{B}) + C$
- ④ $D = (A + B) + \bar{C}$

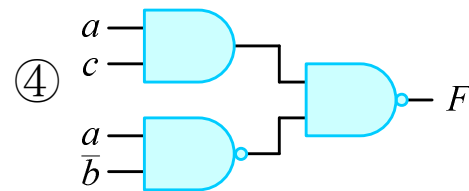
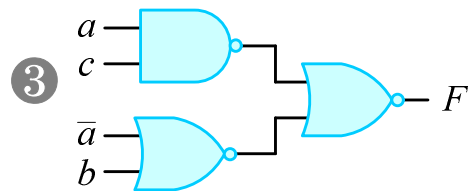
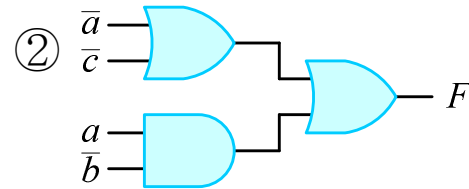
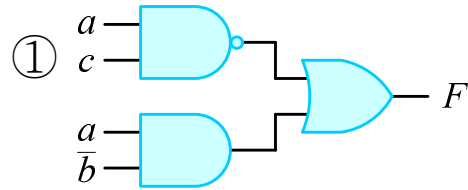


$$D = \overline{\overline{A}B} + C = \overline{\overline{A}} + \overline{B} + C = A + \bar{B} + C = (A + \bar{B}) + C$$

103. $X=AB+CD$ 를 논리회로로 표현하면?



104. $F=\overline{ac}+a\overline{b}$ 의 회로로 **잘못** 설계된 것은?



① $F = \overline{ac} + a\overline{b}$

② $F = \overline{a} + \overline{c} + a\overline{b} = \overline{ac} + a\overline{b}$

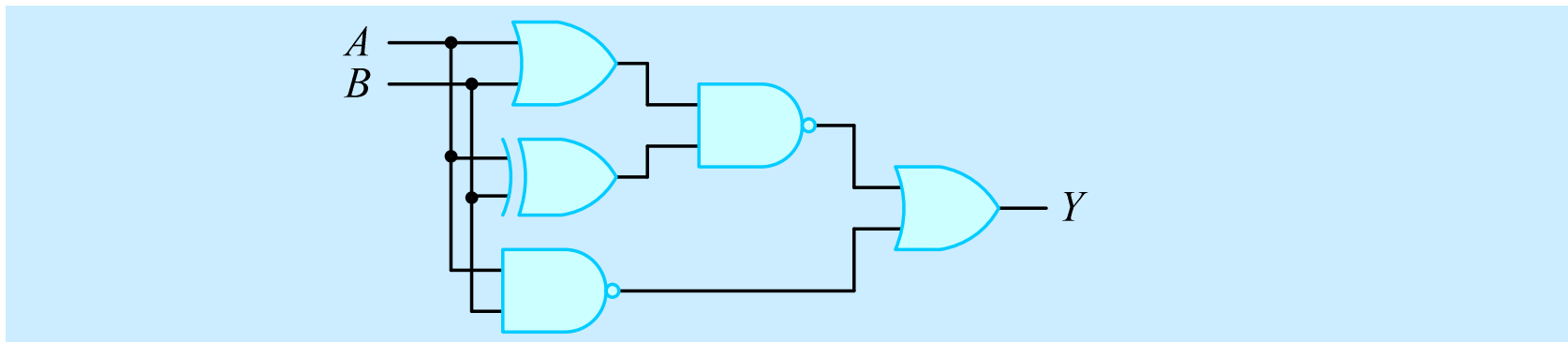
③ $F = \overline{\overline{ac} + \overline{a} + b} = \overline{\overline{ac}} \cdot \overline{\overline{a} + b} = ac(\overline{a} + \overline{b}) = ac\overline{a} + ac\overline{b} = 0 + ac\overline{b} = ac\overline{b}$

④ $F = \overline{ac \cdot a\overline{b}} = \overline{ac} + \overline{a\overline{b}} = \overline{ac} + a\overline{b}$

105. 다음의 논리식을 회로로 구성하기 위해 필요한 논리 게이트의 종류와 개수를 바르게 나타낸 것은?

$$Y = \overline{(A + B) \cdot (A \oplus B)} + \overline{A \cdot B}$$

- ① NOR 2개, XOR 1개, AND 2개
- ② OR 2개, AND 1개, XOR 1개, NAND 1개
- ③ OR 3개, AND 2개, NOT 2개
- ④ OR 2개, XOR 1개, NAND 2개



106. 다음의 진리표에 해당하는 논리식은?

① $F = ABC + \overline{A}BC + \overline{A}\overline{B}C + \overline{A}\overline{B}\overline{C}$

② $F = ABC + \overline{A}BC + \overline{A}\overline{B}C + \overline{A}\overline{B}\overline{C}$

③ $F = ABC + \overline{A}BC + \overline{A}\overline{B}C + \overline{A}\overline{B}\overline{C}$

④ $F = ABC + \overline{A}BC + \overline{A}\overline{B}C + \overline{A}\overline{B}\overline{C}$

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

A	B	C	F	최소항	기호
0	0	0	0	$\overline{A}\overline{B}\overline{C}$	m_0
0	0	1	0	$\overline{A}\overline{B}C$	m_1
0	1	0	0	$\overline{A}B\overline{C}$	m_2
0	1	1	1	$\overline{A}BC$	m_3
1	0	0	0	$A\overline{B}\overline{C}$	m_4
1	0	1	1	$A\overline{B}C$	m_5
1	1	0	1	$AB\overline{C}$	m_6
1	1	1	1	ABC	m_7

107. 다음 진리표를 곱의 합 형식으로 표현한 것은?

- ① $F(A, B, C) = \Sigma m(1, 2, 5, 6)$
- ② $F(A, B, C) = \Sigma m(1, 3, 5, 6)$
- ③ $F(A, B, C) = \Sigma m(1, 4, 5, 6)$
- ④ $F(A, B, C) = \Sigma m(3, 5, 6, 7)$

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

A	B	C	F	최소항	기호
0	0	0	0	$\overline{A}\overline{B}\overline{C}$	m_0
0	0	1	1	$\overline{A}\overline{B}C$	m_1
0	1	0	0	$\overline{A}B\overline{C}$	m_2
0	1	1	1	$\overline{A}BC$	m_3
1	0	0	0	$A\overline{B}\overline{C}$	m_4
1	0	1	1	$A\overline{B}C$	m_5
1	1	0	1	$AB\overline{C}$	m_6
1	1	1	0	ABC	m_7

$$F(A, B, C) = \Sigma m(1, 3, 5, 6)$$

108. 다음 중 최소항(minterm)에 대해 바르게 설명한 것은?

- ① 출력값이 0인 부분
- ② 출력값이 그 자체인 부분
- ③ 출력값이 1인 부분
- ④ 출력값이 OR 형태로 결합된 부분

최소항은 결과가 논리 1의 값을 갖는 것

109. A, B 두 개의 변수로 구성된 논리 함수의 최소항에 속하지 **않는** 것은?

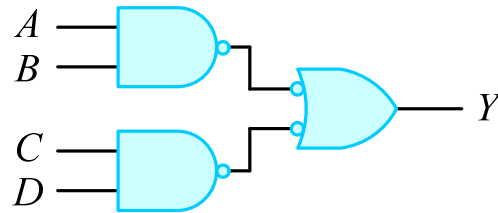
- ① AB
- ② $A\bar{B}$
- ③ $\bar{A}\bar{B}$
- ④ $\bar{A}B$

A	B	최소항	기호
0	0	$\bar{A}\bar{B}$	m_0
0	1	$\bar{A}B$	m_1
1	0	$A\bar{B}$	m_2
1	1	AB	m_3

2변수 최소항의 표현 방법

110. 다음 논리회로의 구성은?

- ① XOR 회로
- ② XNOR 회로
- ③ OR-AND 회로
- ④ AND-OR 회로



$$Y = \overline{\overline{AB}} + \overline{\overline{CD}} = AB + CD$$

111. 다음 논리회로에 대한 진리표는?

①

A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

②

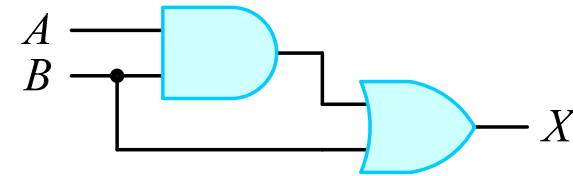
A	B	X
0	0	0
0	1	1
1	0	0
1	1	1

③

A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

④

A	B	X
0	0	1
0	1	0
1	0	1
1	1	0



$$X = AB + B = B(A+1) = B$$

112. 논리 함수 $f(a,b,c)=a\bar{b}+\bar{a}+b$ 의 부정을 구한 것은?

① $a\bar{b}$

② $\bar{a}+b$

③ 0

④ 1

$$\overline{f(a,b,c)} = \overline{a\bar{b} + \bar{a} + b} = \overline{a\bar{b}} \cdot \overline{\bar{a}} \cdot \overline{b} = (\bar{a} + b)\bar{a}\bar{b} = \bar{a}a\bar{b} + \bar{a}b\bar{b} = 0$$

113. 논리 함수 $F = \bar{x}\bar{y}z + \bar{x}y\bar{z}$ 의 보수는?

① $\bar{F} = x + \bar{y}z + y\bar{z}$

② $\bar{F} = \bar{x}y + x\bar{y} + z$

③ $\bar{F} = xy + \bar{x}\bar{y} + \bar{z}$

④ $\bar{F} = x + yz + \bar{y}\bar{z}$

$$\begin{aligned}\bar{F} &= \overline{\bar{x}\bar{y}z + \bar{x}y\bar{z}} = \overline{\bar{x}\bar{y}z} \cdot \overline{\bar{x}y\bar{z}} = (\overline{\bar{x}} + \overline{\bar{y}} + \overline{z})(\overline{\bar{x}} + \overline{y} + \overline{\bar{z}}) = (x + y + \bar{z})(x + \bar{y} + z) \\ &= xx + x\bar{y} + xz + xy + yy + yz + x\bar{z} + \bar{y}z + \bar{z}z \\ &= x + x\bar{y} + xz + xy + yz + x\bar{z} + \bar{y}z \\ &= x(1 + \bar{y} + z + y + \bar{z}) + yz + \bar{y}\bar{z} \\ &= x + yz + \bar{y}\bar{z}\end{aligned}$$

114. 논리식 $Y = \overline{A}B\overline{C} + A\overline{B}C + \overline{A}BC$ 의 부정식($\overline{Y}$)은?

- ① $(A + \overline{B} + C)(\overline{A} + B + \overline{C})(A + \overline{B} + \overline{C})$
- ② $(A + B + C)(\overline{A} + B + C)(A + \overline{B} + \overline{C})$
- ③ $(A + \overline{B} + C)(\overline{A} + \overline{B} + C)(A + \overline{B} + \overline{C})$
- ④ $(A + \overline{B} + C)(\overline{A} + \overline{B} + C)(\overline{A} + B + \overline{C})$

$$\overline{Y} = \overline{\overline{A}B\overline{C} + A\overline{B}C + \overline{A}BC} = (A + \overline{B} + C)(\overline{A} + B + \overline{C})(A + \overline{B} + \overline{C})$$

115. 논리 함수 $F=(\bar{A}+\bar{B}+\bar{C})(\bar{A}+B+\bar{C})$ 의 보수를 구한 결과식으로 옳은 것은?

① $\bar{F} = AC$

② $\bar{F} = A + C$

③ $\bar{F} = AB + \bar{B}C$

④ $\bar{F} = ABC + A\bar{B}\bar{C}$

$$\begin{aligned}\bar{F} &= \overline{(\bar{A}+\bar{B}+\bar{C})(\bar{A}+B+\bar{C})} = \overline{(\bar{A}+\bar{B}+\bar{C})} + \overline{(\bar{A}+B+\bar{C})} \\ &= ABC + A\bar{B}\bar{C} = AC(B + \bar{B}) = AC\end{aligned}$$

116. 불 함수 $F=A+\overline{B}C$ 를 최소항의 합으로 바르게 표시한 것은?

- ① $F(A, B, C) = \Sigma m(1, 4, 5, 6, 7)$ ② $F(A, B, C) = \Sigma m(1, 2, 3, 6, 7)$
 ③ $F(A, B, C) = \Sigma m(1, 3, 5, 6, 7)$ ④ $F(A, B, C) = \Sigma m(1, 2, 4, 6, 7)$

$$\begin{aligned}
 F &= A + \overline{B}C \\
 &= A(\overline{B} + B)(\overline{C} + C) + (\overline{A} + A)\overline{B}C \\
 &= A\overline{B}\overline{C} + A\overline{B}C + AB\overline{C} + ABC + \overline{A}\overline{B}C + A\overline{B}C \\
 &= \overline{A}\overline{B}C + A\overline{B}\overline{C} + A\overline{B}C + AB\overline{C} + ABC \\
 &= m_1 + m_4 + m_5 + m_6 + m_7 = \Sigma m(1, 4, 5, 6, 7)
 \end{aligned}$$

117. 다음 논리식을 최대항으로 나타낸 것은?

$$F = A + BC$$

- ① $F = (A + B + C)(\bar{A} + B + C)(A + B + \bar{C})$
- ② $F = (A + B + C)(A + \bar{B} + C)(A + B + \bar{C})$
- ③ $F = (A + B + C)(A + B + \bar{C})(A + \bar{B} + C)(\bar{A} + B + \bar{C})$
- ④ $F = (A + B + C)(A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})$

$$\begin{aligned}
 F &= A + BC \\
 &= A(\bar{B} + B)(\bar{C} + C) + (\bar{A} + A)BC \\
 &= A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC + \bar{A}BC + ABC \\
 &= m_4 + m_5 + m_6 + m_7 + m_3 \\
 &= \Sigma m(3, 4, 5, 6, 7) \\
 &= \Pi M(0, 1, 2) \\
 &= (A + B + C)(A + B + \bar{C})(A + \bar{B} + C)
 \end{aligned}$$

118. $F(X, Y, Z) = \sum m(0, 2, 3, 4, 7)$ 인 논리식이 있다. 이것을 $F(X, Y, Z) = \prod m()$ 의 형식으로 표현하면?

① $\prod M(1, 3, 6)$

② $\prod M(1, 5, 6)$

③ $\prod M(1, 6)$

④ $\prod M(5, 6)$

$$\begin{aligned} F(X, Y, Z) &= \sum m(0, 2, 3, 4, 7) \\ &= \prod M(1, 5, 6) \end{aligned}$$

119. $F(A, B, C) = \sum m(1, 2, 3, 5)$ 일 때 F 를 바르게 나타낸 것은?

- | | |
|-------------------------|-------------------------|
| Ⓐ $\sum m(1, 4, 6, 7)$ | Ⓑ $\sum m(1, 2, 3, 5)$ |
| Ⓒ $\prod M(1, 2, 3, 5)$ | Ⓓ $\prod M(0, 4, 6, 7)$ |

① Ⓐ, Ⓒ

② Ⓐ, Ⓓ

③ Ⓑ, Ⓒ

④ Ⓑ, Ⓓ

$$\begin{aligned} F(A, B, C) &= \sum m(1, 2, 3, 5) \\ &= \prod M(0, 4, 6, 7) \end{aligned}$$

120. $F(A, B, C) = \sum m(1, 2, 3, 5)$ 일 때 $\overline{F}$ 를 바르게 나타낸 것은?

- | | |
|-------------------------|-------------------------|
| Ⓐ $\sum m(0, 4, 6, 7)$ | Ⓑ $\sum m(1, 2, 3, 5)$ |
| Ⓒ $\prod M(1, 2, 3, 5)$ | Ⓓ $\prod M(0, 4, 6, 7)$ |

① Ⓐ, Ⓒ

② Ⓐ, Ⓓ

③ Ⓑ, Ⓒ

④ Ⓑ, Ⓓ

$$\begin{aligned}\overline{F}(A, B, C) &= \sum m(0, 4, 6, 7) \\ &= \prod M(1, 2, 3, 5)\end{aligned}$$