Solution to Exercise for Test 1

1. 1. resolution 2. data 3. acceleration 4. digitized 5. reconverted

2. (i) digital (ii) convert digital to analogue signals (iii) audio amplifier

3. (i) 8 bits (ii) 4 bytes (iii) 2 nibbles

4. (a) 1001 (b) A00 (c) 0001 0000 0000

5 $1x8^2+6x8+7 = 4X^2+3X+4$, $4X^2+3X-115 = 0$, $(4X+23)(X-5) = 0$, $\therefore X = 5$.

6. (a) $10110_G = 11011_2 = 27_{10} = 0010\ 0111_{BCD}$

   (b) $5742_8 = 101111100010_2 = BE2_{16}$

7. (i) $11101_2 = 29_{10}$, 29/20 = 1 remainder 9, 1/20 = 0 remainder 1, $\therefore\ 11101_2 = 19_{20}$.

   (ii) $2BJ_{20} = 2x20^2+11x20+19 = 1039_{10}$.

8. $43_8 = 35_{10}$, $00110111_{BCD} = 37_{10}$, $24_{16} = 36_{10}$, $00100010_2 = 34_{10}$, $0201_4 = 33_{10}$,

   In ascending order : 0201_4, 00100010_2, 43_8, 24_{16}, 00110111_{BCD}

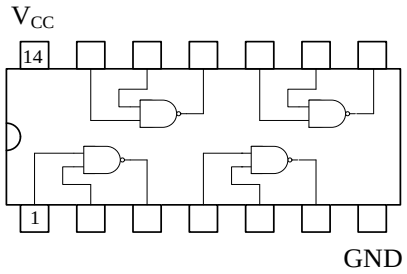
9. All false

10.

(i) A — F = A.A = A

(ii) A, 0 — F = A⊕0 = $A\bar{0}+\bar{A}0$ = A

11.

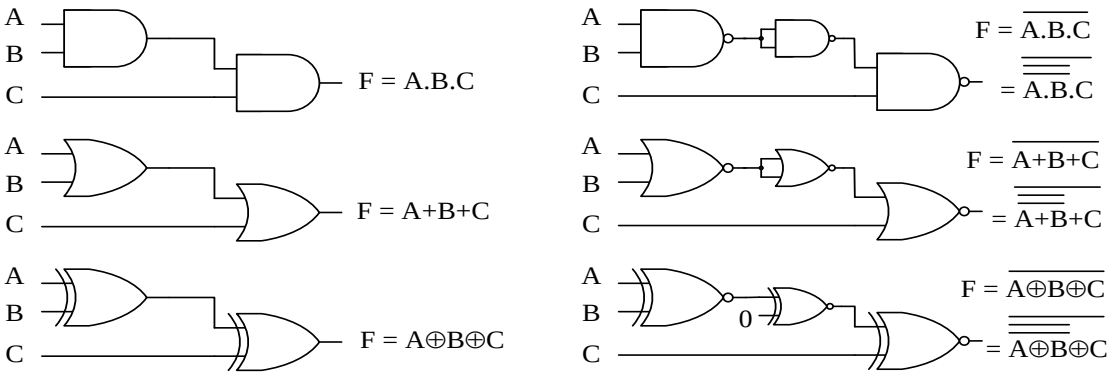


12. Correct statements are (i) and (ii).

13. (a) $F = \overline{\overline{A + \overline{A} + B} + \overline{B + \overline{A} + B}} = (A + \bar{A}.\bar{B})(B + \bar{A}.\bar{B}) = (A + \bar{B}).(B + \bar{A}) = A.B + \bar{A}.\bar{B}$

    (b) $F = \overline{(A + B).(\overline{A.B})} = \overline{(A + B)} + A.B = \bar{A}.\bar{B} + A.B$ Both are X-NOR gates.

14.



AND, OR and X-OR gates can be cascaded, while NAND, NOR and X-NOR gates can't be cascaded directly - requires additional inverter.

15.

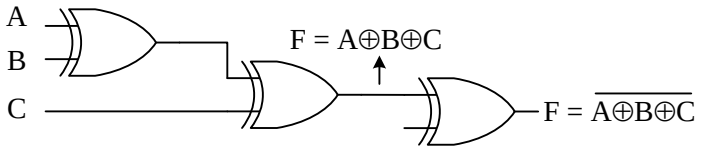
(i) A — F = $\overline{A+A+A}$ = $\overline{A}$; A, 0 — F = $\overline{A+A+0}$ = $\overline{A}$; A, 0 — F = $\overline{A+0+0}$ = $\overline{A}$

(ii) A — F = $\overline{A.A.A}$ = $\overline{A}$; A, 1 — F = $\overline{A.A.1}$ = $\overline{A}$; A, 1 — F = $\overline{A.1.1}$ = $\overline{A}$

(iii) A, 1 — F = A⊕1 = A.$\overline{1}$+$\overline{A}$.1 = $\overline{A}$

(iv) A, 0 — F = $\overline{A \oplus 0}$ = $\overline{A}.\overline{0}$+A.0 = $\overline{A}$

16. (a)



(b)

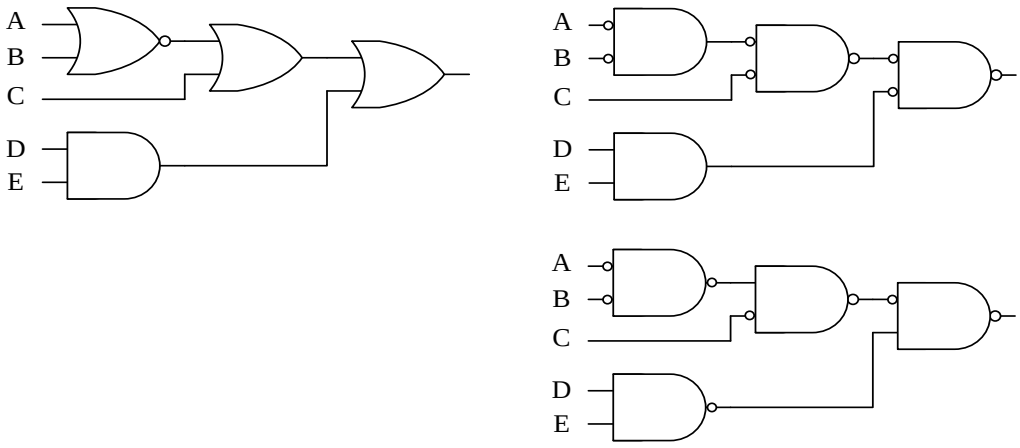
$$F = A + B.C = \overline{\overline{A + B.C}} = \overline{\overline{A}.\overline{B.C}}$$

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

(i) A, B, C — F = $\overline{\overline{A}.\overline{B.C}}$

(ii) A, B, A, C — F = $\overline{(\overline{A+B})+(\overline{A+C})}$

17.



18. $A \oplus B = \overline{\overline{A}.\overline{B} + A.B} = \overline{\overline{A}.\overline{B}} = A + B$

19.

(a)	(UTM)+(UITM) = UTM (1+I) = UTM		True
(b)	AB + BA = ABBA,	ABBA = AB	True
(c)	$KL(\overline{KL} + C) = KLCC$,	$KL\overline{KL} = 0$, KLC = KLCC	True
(d)	$(FKE) \oplus (FKE) = (UTM) \oplus (UTM)$,	A⊕A = 0	True

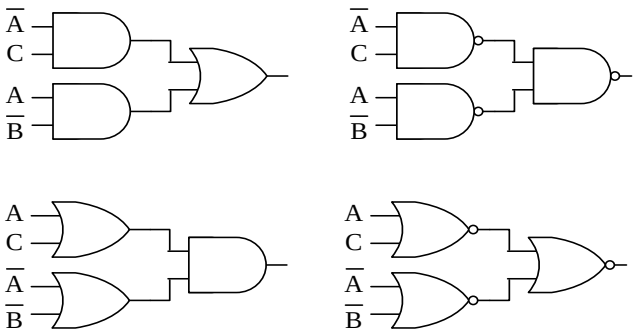
20.

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

$$F(A,B,C) = \Sigma\, m(1, 3, 4, 5) = \overline{A}.\overline{B}.C + \overline{A}.B.C + A.\overline{B}.\overline{C} + A.\overline{B}.C = \overline{A}.C + A.\overline{B}$$

$$= \Pi\, M(0, 2, 6, 7) = (A+B+C)(A+\overline{B}+C)(\overline{A}+\overline{B}+C)(\overline{A}+\overline{B}+\overline{C})$$

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



21.

$$F(A,B,C,D) = \overline{\overline{A.B} + \overline{B}.C}.\overline{\overline{C}.\overline{D}} = \overline{A.B}.\overline{\overline{B}.C}.\overline{\overline{C}.\overline{D}} = (\overline{A}+\overline{B})(B+\overline{C})(\overline{C}+D)$$

$$= \overline{A}.B.\overline{C} + \overline{A}.B.D + \overline{A}.\overline{C} + \overline{A}.\overline{C}.D + \overline{B}.\overline{C} + \overline{B}.\overline{C}.D$$

$$= \overline{A}.B.D + \overline{A}.\overline{C} + \overline{B}.\overline{C}$$